

Landscaping Study – Modern Foods (Working Paper)

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Organisation Gamos



Quick cooking beans save time, fuel & boost nutrition, Photo ©2017CIAT/GeorginaSmith

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Executive Summary

The MECS programme focuses on an alternative strategy to the enduring problem of biomass-based cooking¹. It calls for a greater focus on modern energy as the source of clean cooking, and has evidenced that cooking with modern energy using energy-efficient appliances can be cost effective, particularly for urban communities. To date the programme has focused on household energy consumption. As at February 2020, the programme added research workstreams on energy for institutional cooking, for cooking energy in humanitarian contexts, and proposed that the household work should extend its remit to consider the changing habits of eating.

This was originally called ‘pre-cooking’. The concept underlying the workstream was that when we consider the energy used in the kitchen in the UK, the average has halved since 1970. This has been due to three factors: increased efficiency in appliances; a re-coding of appliances²; and the increased use of easier-to-cook food and bought-in food. The architects of the MECS programme speculated whether a way to reduce the kitchen energy in their target countries in Sub-Saharan Africa (SSA) and South and South-East Asia (SSEA) might be to encourage a greater use of ‘pre-cooking’. A brief internet scan brought to the foreground the work of IDRC in Kenya who had researched and stimulated the production of ‘pre-cooked beans’ (dried beans that retained their nutritional value and could be cooked in a kitchen in 15 minutes in contrast to similar beans requiring several hours of soaking and cooking from raw).

Acknowledging that households across the Global South predominantly process food from a raw to cooked state to produce a meal, a process that is not only timely but energy intensive, depending on the cooking system used, the core research question for the workstream became:

Can the amount of energy to be used in cooking a meal in the kitchen be cost effectively reduced, in a culturally acceptable manner, by partially (or indeed fully) processing food before the household starts adding kitchen energy?

For this landscape study, the team went beyond the idea of ‘pre-cooking beans’ and considered the wider range of different foodstuffs, food preparation and eating behaviours that may displace energy from household kitchens. One particular incident³ reinforced the idea that cooking behaviours are changing, particularly in urban communities, and therefore the landscape study included a view on the social change that means cooking practices are being transformed. This landscape study supports the core aim of MECS by recognising that a holistic approach to cooking needs to be undertaken: energy usage in the kitchen does not simply start the moment the pot is put on to boil, but rather is deeply-nuanced and must be considered from pre-cooking through to post-cooking. Economic prosperity and demographic change have led to significant changes in food culture, with the adoption and increased consumption of pre-cooked and processed foods in eating patterns across the globe.

¹ The ‘enduring problem’ includes early death due to Household Air Pollution (4m/a); deforestation; contribution to climate change, particularly black particulates; the burden on women for both fuel collection and food preparation; a reduction of time for women limiting economic activity; and a stress on urban finances, among other things.

² Strangely, kettles and microwaves were recoded as small appliances, and are no longer counted as being within the kitchen!

³ At a stakeholder meeting in Uganda, the cooking of matoke in an electric pressure cooker (EPC) demonstrated a significantly-reduced cooking time. However, while pleased with the outcome, the result prompted locals to point out that urbanites had already developed shortcuts to cook the dish. Thus, there were two ways to cook the dish: a traditional way and an urban one. They were, nevertheless, impressed that the EPC had delivered a meal that tasted as if it had been cooked in the traditional way, but took the time of the urban approach.

This paper explores what ‘modern foods’ and ‘modern eating’ encompasses, and the opportunities it may offer in reducing energy consumption in the form of ‘modern cooking’ across households in Africa and Asia.

The FAO defines sustainable diets as those “with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources” (FAO 2012).

The nutrition transition narrative suggests that developing countries in SSA and SSEA increasingly tend to favour and consume refined, foreign grains (rice, and wheat) over traditional grains such as maize, millet and sorghum, despite associated concerns around health. Section 4 elaborates the changing eating habits of developing nations, by looking at the interconnected motivators driving change at both consumer and national levels.

Section 5 examines the role food processing plays in feeding a growing global population, specifically in countries where cooking technology is limited, yet the need for nutritious, quality food produce is high. The section highlights rapid growth in consumption of processed foods across Sub-Saharan and South and South-East Asian countries, as well as discussing the limits, extent and changes of the food processing sector. It dwells on emerging interest in developing convenient, modern foods from indigenous, nutritious and resilient crops. It examines the potential benefits that may come from increasing a country’s own national processing sector, especially in developing regions: reduced harvest waste, lower levels of food loss, and improved profit margins in the local agriculture sectors.

Eating out (section 6) both in the forms of going to restaurants and ordering food from external sources to enjoy at home has seen a significant rise in recent years. Whilst existing literature on the topic is heavily focused on eating out in urban contexts across the Global North, this paper attempts to extract evidence for consumption of street food, fast food, and restaurants in the Global South, highlighting that for lower-income earners in particular, street foods and the informal foodservice are significant contributors to their daily dietary intake. It supplements this data through an exploration of online food-delivery services, cloud kitchens and virtual restaurants as they emerge and gain popularity in urban contexts across the Global South, and focuses on the evolving technologies and socio-economic drivers of change responsible for the rapid shift towards eating out.

In looking at food waste (Section 7), this paper addresses the complexities around what constitutes consumer food waste, as distinct from post-harvest losses, and the causes of waste, specifically prioritizing food waste at the household level. The section further describes technical interventions and social factors associated with efforts to reduce food waste. It focuses on access to domestic refrigeration, which requires access to electricity, and the need to understand more about the impacts on food waste.

From a food policy perspective (section 8), this report closely examines the food policy landscape of MECS countries. Notably, trade liberalization and demographic changes are the primary drivers of food innovation, but, as this report emphasizes, a deep understanding of national policy-making is imperative in successfully identifying opportunities to contribute to not only the modernisation of food systems, but also the long-term reduction of domestic energy use in cooking.

Section 9 takes us away from the formal aspects of food to the cultural associations that food, and cooking, embody. Through a cultural-historical lens, we see food as more than sustenance, holding adjunct values of belonging, identity, hierarchy, power and gender. By highlighting the fine balance between culture, food, and energy, this paper makes a start at examining the cultural shifts around food and cooking that need to be considered within the context of modern foods and energy-efficient cooking systems.

Finally, through a series of stakeholder interviews, this report engages with a number of experts on issues encountered in the process of modernizing food systems relating to Covid-19, food safety and nutritional value, energy systems, innovation needs, and socio-cultural trends.

A common theme that has emerged in the research presented is that little attention is given to the energy implications, driven by nutrition, sustainability and economic development, of food-related interventions in the Global South. However, eating consciously is of fundamental importance.

Our aim, then, is to promote foods that are of high nutritional value, yet are low in cost and require low energy in preparation. In identifying smart, pre-cooked, and fermented foods as ‘foods of the future’, eating modern food in a healthy way promises to be easier than originally anticipated. The integration of traditional and modern foods is essential in finding effective solutions for sustainable sustenance and energy across the Global South, whilst maintaining and embracing busy lifestyles.



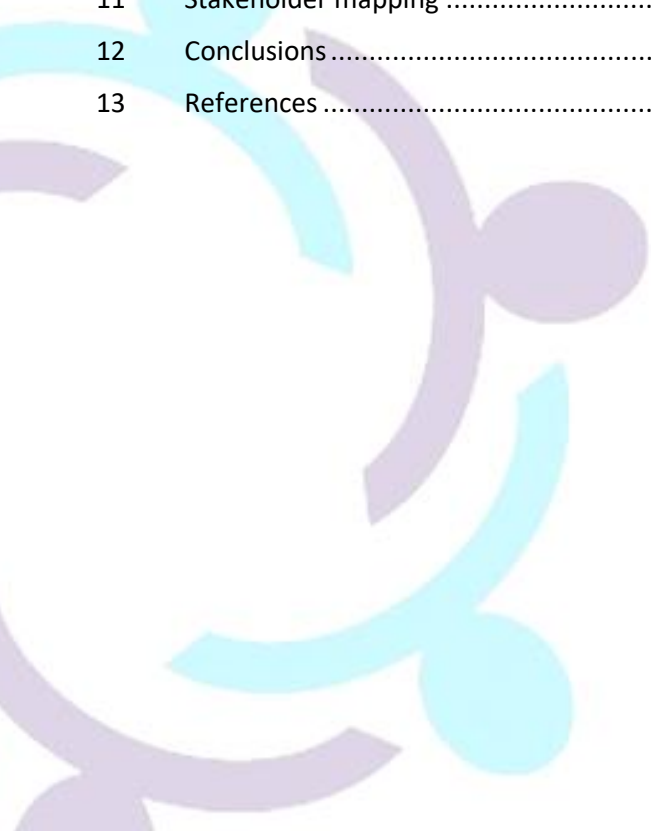
Figure 1 A lady selling dough nuts in Kibra Nairobi Kenya. CC-BY-SA-4.0 Rotichjosphat 2017

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Figure 2 Shell Garage Takeaway seller South Africa CC-BY-SA-4.0 Tefelo Ramollo 2017

1 Introduction

The foundation of the MECS programme was the concept of substituting harmful, traditional fuels with modern fuels for the task of cooking within households. This document considers an additional theme that has the potential also to reduce harmful emissions within the household kitchen by changing the foods cooked. The original idea was sparked by a packet of pre-cooked beans found in a supermarket in Kenya. This was an example of a pre-cooked food that reduced cooking energy demand at the household. The document outlines how thinking on the theme has developed. It addresses the following output described in the MECS proposal:

1c Transition of food industry to more pre-cooking	Innovations and experiments undertaken in enhancing the market for pre-cooked food in 3 countries
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UK households now use half the energy for cooking that they did in 1970. This is partly based on increased efficiency in appliances, partly a reclassification of the data, and partly because UK households' food is processed in various shapes and forms. African households are mainly processing food from its raw state to produce a meal – with all the energy required being used within the household. Processed foods offer the ability to reduce the energy consumption required in the household kitchen. Pasta is a good example of this. The raw food has been processed in a factory, so the argument is that centralised processing in a factory setting can be done much more cleanly and efficiently (e.g. continuous processes, efficient equipment, clean fuels). Enhancing and stimulating a more centralised processing of food could potentially lower the household level requirements for energy, making it easier to transition to modern energy cooking services.

All of the fastest growing economies are low-income countries. This is accompanied by a growth in the middle classes, and improvements in education and infrastructure. In cities, in particular, urban elites are driving these economies and, as they do, their lifestyles and expectations are changing to fit in with modern (western) practices. This affects not only their access to mobile phones, nice clothes, cars and other luxuries, but also the way they eat. Growth in supermarkets, eating out and fast food are examples of ways in which eating habits are changing.

MECS is concerned with the energy implications of these changes in the way people eat. Different foodstuffs, food preparation and eating behaviours can all play a part in displacing energy from the household kitchen.

2 Scope of Study

Increased consumption of pre-cooked and processed foods is part of a global shift in eating patterns, so in order to understand how they fit in wider dietary trends, the study starts with an overview of changes in diet more generally. Changes can be loosely described as adopting a more 'western' diet and is commonly referred to as the "nutrition transition".

The study then focuses on various aspects of eating patterns that have the potential to displace cooking energy from the household kitchen. These include not only the types of foods consumed, but also the ways in which they may be prepared and their impact on food waste:

- Processed foods
- Eating out
- Consumer food waste.

Food companies aim to provide food products that are safe, convenient, and readily available, yet affordable. They employ a variety of food processing technologies in order to achieve a range of objectives:

- Improved shelf life
- Food safety
- Improve the taste, aroma and texture of food (aesthetics)
- Reducing the time and effort needed to prepare food
- Increasing the nutritional value of food.

Reducing the amount of energy required to cook food does not appear to be an explicit object of the food processing industry, although it is implicit in creating convenience products that take less time to prepare in the kitchen. The household cooking energy implications of processed foods fall into two categories:

- **Quick cook foods** – these foods require little energy to cook in the kitchen; pasta and noodles are good examples of this. Industrial manufacture of pasta, for example, uses energy for pasteurisation and drying. Note that pasta is not actually partially cooked in the manufacturing process. Other examples are grains that are converted into products that are edible (tasty) and easily cooked such as couscous, millet and quinoa.
- **Pre-cooked foods** – these foods may still require similar amounts of energy to cook, but processing means that most of the energy can be invested via efficient process and clean fuels using industrial processes, leaving less energy required of the household kitchen. IDRC's work on pre-cooked beans in Kenya is a good example of this⁴. Beans are partially cooked, in a factory, before being packaged and distributed for retail. The time required to cook them in the household kitchen is reduced from 2 hours to 15 minutes. Again, even though convenience may be the primary market force at work, these foods will displace energy from the household kitchen. Note that energy displaced from the kitchen needs to be set against the total energy consumption of the industrial process (not only the partial cooking processes), and the energy required to transport beans from farm gate to factory, and then thereafter packaged beans to retail outlets.
- **Ready meals** – a highly processed food category that fits both pre-cooked foods and eating out foods. Although mostly an industrialised-nation phenomenon, this will almost certainly become a growth industry in developing countries as well. The growth of this industry in developed countries can be linked to diffusion of technology (e.g. freezers and microwaves) and to social changes, such as women going out to work and the increase in single-headed households (e.g. men lacking the skills to cook). Ready meals are distinct from takeaway food in that they can be stored for a certain amount of time (frozen or chilled) and then need to be heated up in the kitchen, mostly in an oven or microwave.

Eating out is a complex topic widely associated with economic development and an increase in disposable income. However, fast foods and takeaways are examples of eating out that is more commonly found among lower socio-economic groups, and this can also be found in Africa and Asia in the popularity of street vendors. This is demonstrated in a study of Tanzanian street vendors, who mostly commonly cooked rice and ugali – cheap, everyday staples. Different types of eating-out establishments reflect different consumer motivations: high quality restaurants (expensive) offer special food and a social experience; takeaways and street vendors offer convenience, obviating the need to prepare a meal, or even just a dish.

Reduced waste. Whenever food is cooked, energy is invested in the end product. Therefore, whenever food is thrown away, that energy is lost and represents an unnecessary use of energy in the kitchen. There are two approaches to minimising waste:

⁴ <https://www.idrc.ca/en/project/precooked-beans-food-nutrition-and-income-kenya-and-uganda>

- Storage and reheating – the energy relationships are complex and non-linear. For example, if too much rice is cooked one day but the excess can be used the next day, then the next day's cooking load will be reduced, but not proportionately. Most of the energy is used to bring water to the boil, and to maintain heat losses from the pan, so some savings can be achieved by reducing the amount of water needed, and additional savings can be made if the reduction in demand means that a smaller pan can be used. Domestic refrigeration is key to enabling storage and reheating of food.
- Matching supply to demand – in developed nations there is a growing movement to reduce food waste. Action revolves around ensuring that food is consumed before it “goes out of date”, perishes, and needs to be thrown away. A number of technical solutions are being developed to help control stock in supermarkets more effectively, and many communities have local schemes to distribute out of date food before it perishes. However, these address the distribution of foods and have no impact on cooking. There is one technology-based exception. Mobile phones apps have been developed to put people who have excess food (often cooked meals) in touch with people willing to accept such. Some target food prepared by individuals (e.g. Olio), and others target the hospitality industry (e.g. Too good to go).

3 Definitions

3.1 Classifications of foods and processed foods

The analysis of food market data requires definitions of the categories of food in question. There exist a number of international classification systems that have individual approaches, which will be briefly outlined here.

The Food and Agriculture Organization of the United Nations (FAO) has balance sheets which divide a country's food market into Domestic Production, Imports and Exports, further classifying whether its purpose is Food, Feed or Seed (FAOSTAT data). Under these headings the market is then categorised by broad item groups, like Animal Products, and then by specific food items such as Wheat and Products or Sugar and Sweeteners. The unit of value employed is volume, normally in thousands of tonnes⁵. The FAO define FAOSTAT's 'Processed' metric as:

“The amounts of the commodity in question used during the reference period for manufacture of processed commodities which could not be converted back to their originating primary commodities or which are part of a separate food groups.”⁶

Statista and Passport offer an approach which divides the food market into categories like Bread and Cereal Products and then into specific items such as Pasta, Rice, Bread and Other Cereal Products. Statista offers a range of unit values including volume and revenue with further statistics per capita as well. Passport Global Market Information Database (Passport GMID) from Euromonitor uses the large heading of Packaged Food. It then breaks this down into the categories Dairy, Staple Foods and Cooking Ingredients and Meals which subdivide into more specific categories like Cheese or Breakfast Cereals. The unit of value employed is generally Retail Value but, depending on the sub category, there are other units available. Euromonitor's 'Packaged Food' definition has been used as a proxy for processed food in previous studies (Monteiro et al., 2013). As detailed by Euromonitor (Euromonitor International, 2020), Packaged food's retail value datum is comprised of two parts; retail sales and foodservice. Retail sales are driven by supermarkets and other food outlets whose primary business is the sale of food for domestic consumption. Foodservice sales are food sales that are to be consumed

⁵ <http://www.fao.org/faostat/en/#data/FB>

⁶ <http://www.fao.org/waicent/faostat/agricult/cb-f.htm>

out of the home. This includes restaurants, cafés and bars. Institutional sales are excluded from the retail value figure.

The MECS programme is primarily concerned with processed foods that could potentially reduce energy demand in the kitchen. From the Euromonitor data this includes Ready Meals, Sauces, Dressings and Condiments, Soup, Sweet Spreads, Baked Goods, Breakfast Cereals, Processed Fruit and Vegetables, Processed Meat and Seafood, Rice, Pasta and Noodles.

Classifications of processed food have, until recently, been ambiguous. Much of the data around the topic consists of a binary description of processed or unprocessed. However, not only is the extent of processing consequential, almost all foods are processed to some degree (Monteiro et al., 2009). The distinction between processed and unprocessed food is, thus, moot. To capture meaningful information on the level of processing undergone, many systems of classification have been proposed. The United Nation's NOVA (which is not an acronym) classification is the most specific, coherent and comprehensive when compared to other systems (Moubarac et al., 2014). NOVA defines food processing formally as:

“physical, biological and chemical processes used after foods are separated from nature, and before being consumed or prepared as dishes and meals.” (Monteiro et al., 2018)

NOVA excludes all forms of agriculture from the processing term and culinary preparation in the home or a restaurant are excluded as they are not industrial. (Monteiro et al., 2012) (Monteiro et al., 2018). The classification specifies four groups:

1. Unprocessed or minimally-processed foods. Examples include fresh, frozen or dried fruit and vegetables; brown, white or parboiled rice; legumes such as all beans, lentils and chickpeas; potatoes and cassava; meat, poultry, fish and seafood; eggs; milk, pasteurized or powdered; pasta, couscous and polenta without added oil or salt; spices and herbs; drinking water. A selection of the corresponding processes includes drying, crushing, grinding, roasting, boiling, pasteurisation, freezing, vacuum packing.
2. Processed culinary ingredients. Examples include vegetable oils from various seeds, nuts or fruits; butter and lard from milk and pork; sugar from cane or beet; salt from sea water. Processes include pressing, refining, grinding, milling and drying.
3. Processed foods. Examples consist of canned or bottled vegetables, fruits and legumes; salted, pickled cured or smoked meats or other animal foods; canned fish; cheeses; unpackaged freshly made breads. Group 3 processes include various preservation and cooking methods. They have two or three ingredients and are recognisable as modified versions of Group 1 foods.
4. Ultra-processed foods. Examples include carbonated drinks; packaged snacks; mass-produced breads; margarines and spreads; infant formulas, follow-on milks and other baby products; pre-prepared pies, pasta and pizza dishes; sausages, burgers and other reconstituted meat products; powdered and packaged instant soups, noodles and desserts. Related processes include those with no domestic equivalent such as hydrogenation, extrusion, moulding and pre-processing for frying (Monteiro et al., 2018).

Although this classification was primarily developed from a human health perspective, it's application is of note from an energy perspective. As NOVA details the extent of processing, it postulated that the higher the foodstuff's group, the more energy demand is required in its production. For example, the energy consumption of a pre-prepared and packaged convenience meal belonging to Group 4 is far more than that of a solar dried banana belonging to Group 1. Groups 3 and 4 are interesting when considering the displacement of culinary

energy away from the domestic environment. The energy required to produce a Group 3 or 4 food is likely to be much higher than a Group 1 or 2 food. However, the energy input required in the home environment may be reduced. Using beans as an example, pre-cooked canned beans (Group 3) require much less domestic energy than dried beans (Group 1) which consume considerable time in cooking and hence energy (Schoeninger et al., 2017).

Despite appearing to be a useful system, none of the literature to date makes reference to the NOVA typology so it has not been explored further in this paper. If this system is widely adopted, and national consumption profiles based on the NOVA level of processing become available, then a more nuanced view of the extent of processing and energy use may become possible.

3.2 Eating out

MECS is concerned with eating out behaviour because food prepared outside the home corresponds to a reduction in household cooking energy (under the assumption that otherwise food would have been prepared in the home), which is a key objective of MECS. In fact, it is a displacement of cooking energy from inside the household to outside the household, and we are mindful that the consequences of this displacement are also an area that should be assessed.

The definition of the broad, over-arching term 'eating out' comes down to location, although it is complicated by the highlighting of different aspects of location and activity. Some definitions consider the place of consumption, and others the place of preparation when defining eating out. This issue is insightfully dealt with and discussed in a systematic review by Lachat et al, which reviews the evidence for the association between eating out of the home and dietary intake (Lachat et al., 2012). In the study inclusion criteria, Lachat et al accept studies that define eating out either by place of consumption or place of preparation, finding 13 studies that take each approach (out of 29). However, these two different definitions present difficulties, and the incoherence of eating out definitions is discussed as a study limitation. Lachat et al argue that from a nutrition and health perspective, it is the place of preparation which is relevant and which determines the nutritional composition of the food, not the place of the consumption. They recommend that surveys aiming to record out of home eating behaviour record the place of preparation rather than consumption, noting that otherwise, takeaway meals eaten at home are misclassified as home foods. This is particularly relevant in current times when use of the online food delivery industry is becoming more prevalent in global eating out habits, increasing access to takeaway meals consumed at home. The reverse misclassification is also possible, given people might prepare food at home and take it with them to consume outside of the house during the day.

The MECS perspective is concerned with place of energy expenditure to prepare foods, so the classification by place of preparation is also the most meaningful way of defining eating out for MECS purposes. It addresses the focus of household energy use in cooking. Takeaways eaten at home are therefore still under the eating out domain, and lunches pre-cooked at home and consumed in, for example, the workplace, are not. Therefore, the definition of eating out from a MECS perspective is conveniently in line with health and nutrition motivated research, and essentially comprises the question of where the energy to make the food was expended – if outside the home, the food has been 'eaten out'.

Other terms associated with eating out that have been found in the literature are: food away from home, non-home prepared foods, away-from-home eating, outdoor eating.

3.2.1 Subsections of Eating Out

Having dealt with the over-arching term ‘eating out’, further definitions are required for subcategories of venue and type of food, which relate to different behaviours, trends, and drivers. In order to understand the current state of play of eating out and how it is changing, it is necessary to subdivide it.

Unfortunately, this is not straightforward because context changes how a food is defined or understood culturally. Lachat et al note that ‘The definition of sources of eating OH [out-of-home] is largely context dependent; what is considered fast food in China might be considered as restaurant food elsewhere’ (Lachat et al., 2012). This presents a challenge in categorization of subcategories of eating out, particularly as much research is directed at one or more of the subcategories, rather than eating out in general.

The following sections consider the various subcategories of eating out and the different approaches to making the divisions. Firstly, we cover foodservice industry definitions from Euromonitor and Statista. Following this, we define online food delivery services, as these are disrupting the foodservice industry. Then, we describe how ‘street food’, ‘fast food outlets’ and ‘restaurants’ are defined in existing academic discussion and research. Street food and fast food are common terms in literature about eating out relevant to Global South contexts, and although ‘restaurants’ is a rarer term, it is included for completeness. Finally, we consider another classification approach found in the literature, that of splitting the foodservice into ‘formal’ and ‘informal’. We briefly discuss on how the different definitions relate to the MECS objectives throughout and finally, we comment on definitions settled on for this report.



Figure 3 Cafe in Ethiopia CC-BY-2.0 Martijn.Munneke 2012

3.2.2 Food service industry definitions

Euromonitor provides a breakdown of the foodservice industry by type (Passport Euromonitor, 2020):

1. Street stalls/kiosks
2. Cafés /bars
3. Self-service cafeterias
4. Limited-service restaurants (LSR)⁷
5. Full-service restaurants (FSR)

Street stalls/kiosks are characterized as sometimes mobile, serving a limited product offering as takeaway food at low prices. Cafés/bars are defined by establishments deriving 50% or more of their income from drinks sales, and where the focus is on drinking rather than eating. Self-service cafeterias have no or limited service, and food is self-served or collected at several counters. Limited-service restaurants contain takeaway and fast food outlets, and virtual or cloud kitchens which produce food for delivery only (described in the next section). Full-service restaurants encompass sit-down establishments with table service.

However, examination of these definitions shows them to be Global North-centric in terms of the characteristics they describe in each category. For example, sit-down restaurants (non-tourist) in countries such as Tanzania can have characteristics of FSR (table service, payment at the end) and LSR (the food can be already cooked and is quick to serve; is not particularly high quality). There is a spectrum of establishments in MECS focused countries which may not be adequately described or characterized by these definitions. Furthermore, it is also unclear if the informal sector (here referring to non-contractual or licensed business/employment) is featured in the data gathered. This is significant because the foodservice in developing countries, and street food in particular, is frequently in the informal sector (FAO, 2007).

3.2.3 Online Food Delivery Services and Cloud Kitchens

Within the eating out food industry, the ability to order food online through mobile phone apps via third party delivery services is a hugely disruptive innovation which is changing the way the industry works. In the past, if food delivery was available it would be offered by restaurants, and the ordering process would be direct to the restaurant either by ringing the restaurant itself, or perhaps in more recent years through an online website interface. With the increasing use of smart phones and thus access to mobile phone apps, food delivery services that operate independently to the food outlets are transforming the restaurant industry.

Food delivery service providers are companies which partner with a variety of food outlets in order to be able to list them on their application. The customer can then choose between different restaurants in a single list, assisted by search and sorting algorithms, put the order in through the app, and the delivery company delivers the food from the restaurant to the customer. The business model is such that the delivery provider gets a commission from the cost of the food ordered by the customer, the value of which can vary between 7%-30% across countries and companies (lower bound reported in a publication about the Indian context (Meenakshi & Sinha, 2019), upper bound reported from a news article about the industry in the USA (Isaac & Yaffe-Bellany, 2019)).

As the online food delivery market grows globally, another phenomenon is growing and gaining traction alongside it: that of 'cloud', 'ghost' or 'virtual kitchens', and 'virtual restaurants'. These are kitchen spaces where

⁷ In Statista, the term 'quick service restaurants' appears to be synonymous with the limited-service restaurants defined by Euromonitor.

foods are made specifically for delivery, and where establishments have no front-of-house in terms of dining space for customers (Khan, 2020).

There isn't much documentation about cloud kitchens yet in academic literature apart from useful descriptions and typology discussion in Khan (2020), which mentions that they will provide competition to the food-tech industry in India (Meenakshi & Sinha, 2019), and a study about how they might perturb the food industry in Malaysia (Chern & Ahmad, 2020). However, as with many recent trends, there are various news article and blog posts about their emergence, their characteristics, and how to take advantage of them.

Terminology is not completely clear across the various discussions, but usually the term 'virtual kitchen' is used to refer to the physical space where the food is prepared solely for delivery purposes. A 'virtual restaurant' is then the brands of food that are prepared in that space. Users of virtual kitchens are by no means constrained by offering one 'brand' or 'restaurant', but can produce food marketed across the apps as several different brands. For example, in San Francisco, the owner of the physical restaurant Top Round Roast Beef also prepares food for three virtual restaurants in the same place: Red Ribbon Fried Chicken, TR Burgers and Wings, and Ice Cream Custard (Isaac & Yaffe-Bellany, 2019). In this way, one kitchen might be home to various 'restaurants', all owned by the same company and staffed by the same people. The users might have no idea that the restaurant they are ordering from doesn't exist in the traditional sense.

3.2.4 Street food

Street food is an important component of the 'eating out' industry for Global South countries, providing many employment opportunities and a significant food source for low-income populations (Cardoso et al., 2014). The Food and Agriculture Organization (FAO) of the United Nations set a definition of street food in 1988:

'ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers especially in streets and other similar places' (FAO, 1988).

However, this is not used across all street food research; indeed, just over half of the research into street food does not set a definition for street food. Abrahale et al reviewed global street food research in a 2019 review, and out of 441 articles, 52.2% did not specify a definition of street food (Abrahale et al., 2019). Of those that did define it, 41.7% used the FAO definition above, while 16.1% used definitions from other references or made their own. Clearly, a lack of definition weakens the potential for research learnings to be applied to other situations.



Figure 4 A woman cooks samosas on a small stove at a market in Mogadishu, Somalia, during the holy month of Ramadan on July 11. AU UN IST PHOTO / ILYAS A. ABUKAR

Building upon the FAO definition, factors such as the place of sale and the permanent or temporary nature of infrastructure are emphasized and discussed in the issue of street food classification. Mwangi et al include that street foods are sold in 'streets or open places' rather than in 'stores and licensed establishments' (Mwangi et al., 2001). Other studies define that street food establishments should not be 'permanent', but rather mobile and easy to dismantle; in a systematic review of dietary contribution of street food in developing countries, Steyn et al only include venues that do not have permanent walls (Steyn et al., 2013). Of course, this relies on a definition of 'permanent' and 'temporary'.

Place of preparation is also discussed as a means of classification within street foods, although with less attention than for the general term 'eating out'. In a 1996 study about street food in Calcutta, street food is split into three categories: 1) prepared at home and brought to a stall for sale; 2) prepared and sold at the stall; 3) prepared in a small scale 'cottage type' factory and sold at the stall (Chakravarty & Canet, 1996). Building on this, Steyn et al add a fourth category of 'food processed and packaged by industrial factories' given that more recent developments see processed packaged food and beverages (such as crisps, biscuits and soft drinks) also commonly sold by street vendors (Steyn et al., 2013)⁸.

Evidently, there is a range of definitions with varying detail used to define what the term 'street food' refers to, and there are distinctions within street food vending that are important considerations for household energy use. This lack of cohesion around a standard definition of street foods causes difficulty in aggregation of the research and means that careful attention is required to assess the definition of street food in each study reviewed.

3.2.5 Fast food outlets

Studies differentiate by 'Western' fast food and 'traditional' or 'indigenous' fast food, both in terms of type of food, and type of physical outlet. The following studies are for Global South focused studies, rather than Global North, because MECS is concerned with the Global South contexts and also this is where the most confusion lies over the term 'fast food' due to the wide variety of food outlets in operation.

Olutayo, reviewing fast food consumption in Ibadan in Nigeria, makes a distinction between types of food: 'foreign fast foods' are foods like burgers and hotdogs, commonly served in international fast food franchises, but also by locally-owned fast food outlets (that pre-existed the international franchises) (Olutayo & Akanle, 2009). 'Indigenous' or 'traditional' fast foods are local foods, either sold on the street, or through 'bukas' which are traditional fast food eateries in Nigeria. In other studies, the distinction is less clear: Van Zyl et al survey habits among young adults in Johannesburg (Van Zyl et al., 2010), and Ayo et al study fast food consumption in Kampala (Ayo et al., 2012). In neither is the definition of fast food clear (due to unavailability of the full manuscript (Van Zyl), or lack of definition (Ayo)), but the foods discussed in the results are mostly 'foreign fast foods'.

Focusing instead on the outlet, in analyzing fast food and street food consumption in South Africa Steyn et al defines fast food outlets to be those in formal buildings or malls that are often a franchise (Steyn et al., 2011). They acknowledge a limitation in their study in that it did not record type of fast food consumed, which may influence their classification using infrastructure.

⁸ The term 'industrialized food' is used within street food to refer to those snacks or drinks that are not prepared by the vendor, but mass produced in the food industry (Sousa et al., 2019).

Finally, in a study focusing on rural South Africa, Feeley et al considers local fried foods sold from buildings, in some cases converted garages, to be ‘fast foods’, without a discussion of the ‘foreign’ or ‘traditional’ divide, though the foods in question would be classed as ‘traditional’ (Feeley et al., 2011).

It is reasonably common that a distinction is made between local/traditional fast foods and ‘western’ style fast foods. Unfortunately the literature also shows evidence (most clearly in Olutayo & Akanle (2009)) of an overlap in the terms ‘fast food’ and ‘street food’ when only type of food is considered, rather than also including physical infrastructure.

3.2.6 Restaurants

There is a lack of cohesive definition for non-fast food restaurants (full-service restaurants as defined by Euromonitor) in MECS focus country contexts, and indeed due to the vast range of establishments in terms of level of formality and socio-economic customer group, one definition would be misleading. Restaurants range from the small, informal establishments catering to low-income populations, to formal restaurant chains and high-end dining. For low-income earners, small traditional restaurants are often discussed in the same class as street vendors. In their definition of the informal food sector, the FAO include ‘small restaurants and caterers’, who may not be registered with the local government or pay taxes (FAO, 2007). Similarly, studying the informal foodservice in a Cape Town township, Petersen et al include ‘eating houses/budget restaurants’ alongside street vendors. In some cases, physical infrastructure is used in definitions: Karimi et al compare the frying practices of street vendors and restaurants, defining restaurants as being enclosed facilities with designated dining areas, though they acknowledge that these structures can be temporary in nature, constructed out of iron sheets, and target the same low-income earners as street vendors (Karimi et al., 2017). In Onyeneho & Hedberg (2013), differentiation is made between hotel restaurants, ‘regular/fast food’ types, school cafeterias, and foods vended on, or next to, the street – most likely, small informal restaurants come in the latter category.



Figure 5 One of the main streets in Yasothon was turned into a street food market during the Yasothon Rocket Festival CC-BY-SA-3.0 Self-published work by User:Takeaway

3.2.7 Informal vs Formal Characterization

Rather than typifying the food type or outlet type, some literature uses ‘informal’ vs ‘formal’ as a characterization of eating out establishments. In a survey of the ‘informal foodservice’ in Cape Town, South Africa, Petersen et al define informal as the ‘township cash economy of fast food, takeaways, and prepared meals’, a definition that is South Africa specific due to the townships context (Petersen et al., 2018). Of this informal foodservice, 79% consists of street-based BBQ and deep-fried takeaway outlets, and 21% is ‘eating houses/budget restaurants’ with a venue for seated food consumption. Regarding infrastructure, 75% have temporary structures (tents, tables, BBQs, self-built units) and 25% are run out of private homes. Similarly, Battersby et al map the ‘informal food economy’, also focused on Cape Town (Battersby et al., 2016). This term encompasses more than just ready-to-eat food sold by street vendors or small restaurants, but also includes informal convenience stores, fruit and vegetable sellers and sellers of livestock.

It is notable that both these studies refer to townships in Cape Town, South Africa, but the term is also in use across the food sector. The FAO refers to the ‘informal food sector’, which consists of street vendors, market vendors, small restaurants and caterers, and urban agriculturalists (FAO, 2007). The evolution in the definition of ‘Informal’ is discussed, as increasing understanding that informal actors are often in some way legally recognized by authorities (trade associations, cooperatives), and that informal and formal sectors are interdependent, has given a more nuanced meaning to ‘informal’. They conclude that the informal food sector includes actors involved in both unrecognised activities and legal activities related to food services, from production, transport, processing, and sales.

The useful aspect of the informal food sector as defined by the FAO is that it contains reference to both street vendors and small restaurants, which, as discussed above, there has been less recognition of elsewhere.



Figure 6 Street food in Bangkok, Thailand. CC2013 David Magnus Manske

3.2.8 MECS Definitions

The industry definitions and academic terms relating to the Global South do not neatly align, and informality of the foodservice could touch on street food, fast food, and restaurants in the Global South (depending on exactly which aspect of informality is intended). The differing and overlapping terms used in industry analysis and academia (and within academia) calls for more research to focus on a complete and accurate classification system for eating outlets in Global South contexts. This could include working with industry categorisations which are well suited to Global North contexts and adapting them to suit characteristics found in eating out establishments in the Global South.

For current MECS activity, we build on the use of place of preparation criterion used to define eating out, and extend this to define sub-divisions:

- Street food: food prepared on the street
- Limited-service restaurants / fast food restaurants
 - o 'Westernised' fast food restaurants (serving foods found in international fast food companies, such as KFC, McDonalds)
 - o 'Traditional' fast food restaurants (serving local fast food items)
 - o Virtual and cloud kitchens used through food delivery services
- Other restaurants in Global South contexts (most closely aligned to full-service restaurants in the industry definition but acknowledging that this doesn't quite fit)
- Online food delivery services (including cloud kitchens).

A slight confounding factor in pursuit of a clear-cut definition using place of preparation occurs for street food, regarding the issue identified in the Calcutta study, where there was a sub-group of vendors who made the food in their own homes (Chakravarty & Canet, 1996). More recently, in Cape Town, a survey of food vendors showed that 25% were actually operating out of private homes, with the rest in temporary structures (Petersen et al., 2018), though whether or not there were many street food vendors in this category is unknown as the data was not disaggregated in that way. To resolve this, the prevalence of street-vended food cooked in private homes should be investigated by MECS in the upcoming workstream as an edge case of interest in the theme of reduction of household energy use.

3.3 Consumer food waste

A figure that has been seized on by many organisations with different agendas is that one third of food produced globally is not eaten. This is portrayed as a scandal on a number of fronts, e.g. the world's poor could be fed, it is a waste of agricultural resources, a waste of time and effort, it needs to be disposed of safely, and all that rotting food gives off greenhouse gases. FAO identify key stages along the food supply chain where food is lost or wasted (FAO, 2011):

- Agricultural production (on the farm)
- Post-harvest handling and storage
- Processing
- Distribution (including retailing)
- Consumption.

The FAO nicely categorise the different parts of the value chain from field to bin where waste occurs into two parts⁹:

- **Food loss** is the decrease in the quantity or quality of food resulting from decisions and actions by food suppliers in the chain, excluding retailers, food service providers and consumers (SOFA, 2019).
- **Food waste** refers to the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food service providers and consumers (SOFA, 2019).

MECS is concerned with displacing energy from the household kitchen, so within the food waste category, it is consumer waste that is the component of interest. This represents food cooked in the kitchen that is subsequently thrown away. The hypothesis is that reducing consumer food waste will reduce the total amount of food cooked and, therefore, the amount of cooking energy used in the kitchen.

Consumer food waste comprises different types of waste food (drawn from Ramukhwatho et al., 2014):

- Cooked food not consumed (excess)
- Cooked food that is spoiled
- Peelings etc. discarded in vegetable and fruit preparation
- Meat scraps
- Undesirable raw food.

Clearly, food waste that is created as an integral part of food preparation and cooking cannot reasonably be avoided, e.g. vegetable peelings. This raises the issue of 'avoidable' food waste; BFNC (REF) summarised these definitions by the Waste Resources Action Programme (WRAP)¹⁰:

- **Avoidable:** food and drinks that are thrown away despite still being edible (for example, slices of bread, apples, meat, etc.);
- **Possibly Avoidable:** food and drinks that some people consume and some do not (for example, bread crusts), or food that can be edible, if cooked one way instead of another (such as potato skins, etc.);
- **Unavoidable:** waste deriving from the preparation of food or drinks that are not, and could not, be edible (for example, meat bones, egg shells, pineapple skins, etc.).

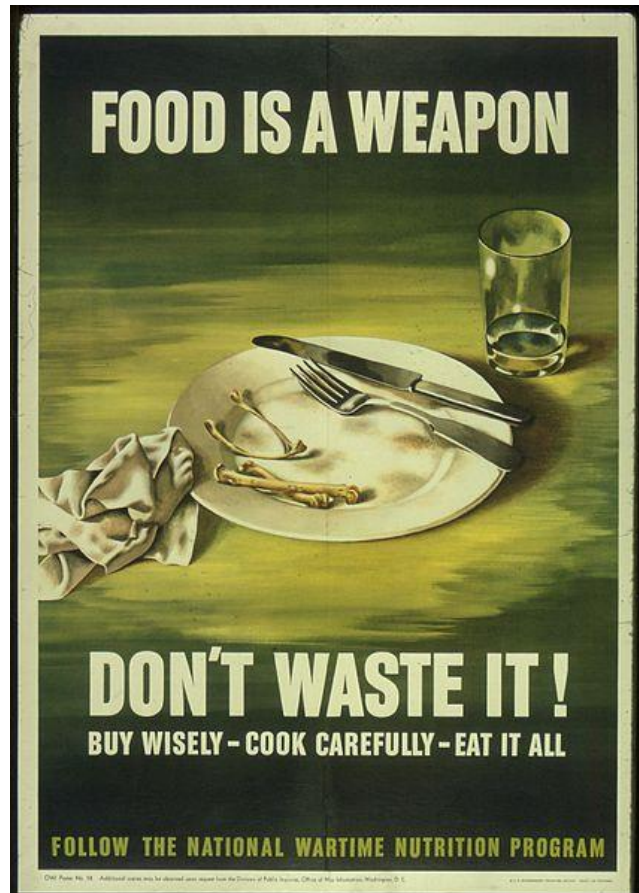


Figure 7 An appeal during the Second World War Author Unknown Office of War Information. (03/09/1943 - 09/15/1945)

⁹ <http://www.fao.org/platform-food-loss-waste/en/>

¹⁰ <https://www.wrap.org.uk/>

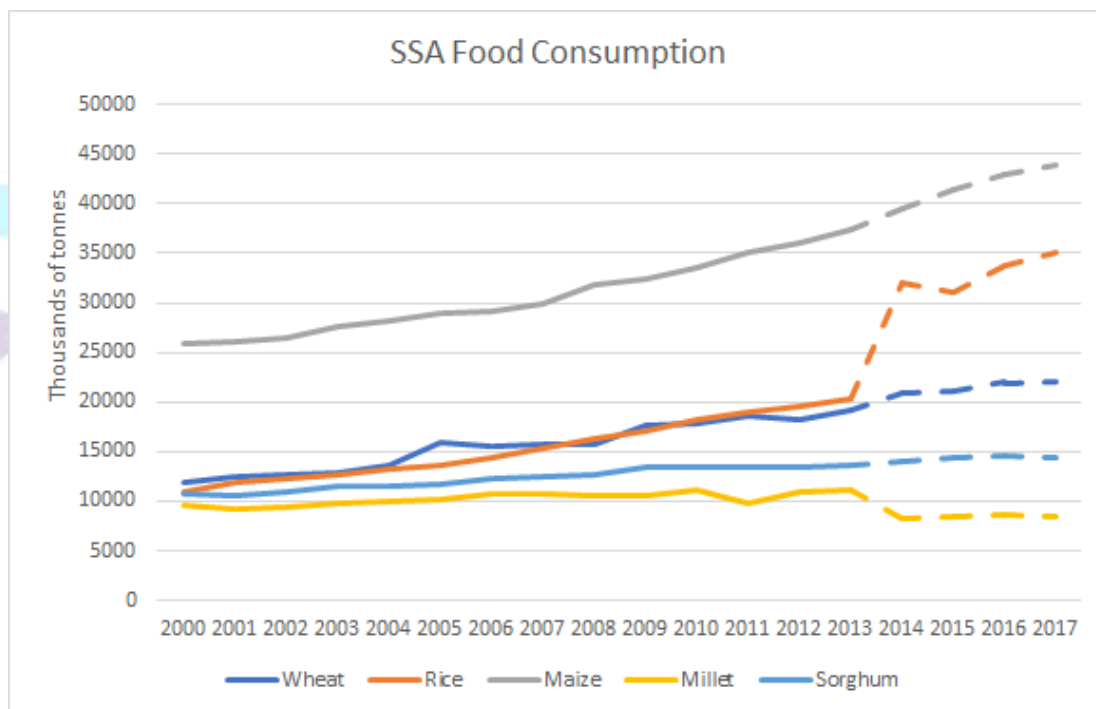
4 The Nutrition Transition

4.1 Food trends

A wealth of literature on the eating habits of the developing world refer to what is called the “nutrition transition” (Hawkes et al., 2017), (Thow, 2009), (Popkin, 2003), (Hawkes, 2005). This title describes the overarching patterns of dietary change currently being observed in developing countries. Specifically, this is the convergence towards diets that are high in refined grains, processed foods, animal products, fats and edible oils, sugar and salt. This is in conjunction with a decrease in the consumption of traditional, nutrient-dense staple cereals, coarse whole grains and pulses. The nutrition transition to what is sometimes termed the ‘Western diet’ (Khoury et al., 2014), (Popkin, 2003) is the source of much concern on the health front, strongly associated with rising chronic diseases and obesity levels among developing nations (10).

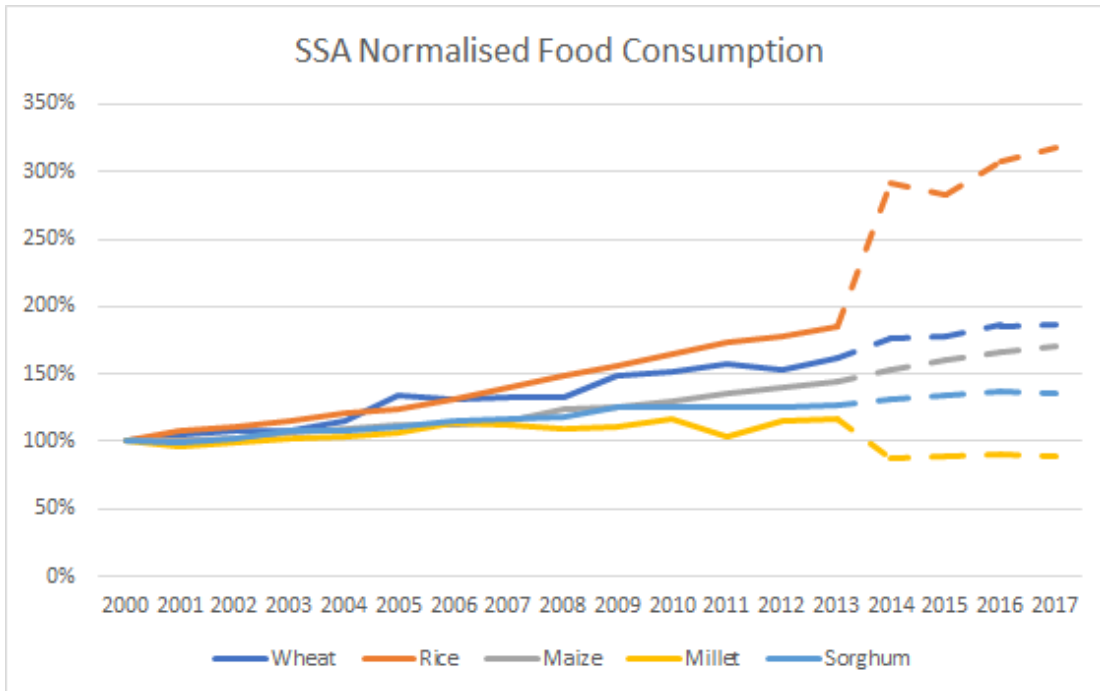
This section will examine trends in cereal consumption in Sub-Saharan Africa (SSA) and South and South-East Asia (SSEA), analysing both the absolute and percentage changes in each crop and whether this supports the nutrition transition narrative. It will then compare the percentage change in cereal consumption with that of various animal products, along with the proportional change in food consumption as a whole to examine the hypothesis that consumption of animal products is increasing.

Note that 2013/2014 moves from old to new FAOSTAT balance sheets. There is a remarkable increase in the consumption of rice in both SSA and SSEA over this period which suggests a transition in balance sheet methodologies. The dotted lines on the following figures indicate figures based on the revised balance sheet methodology.



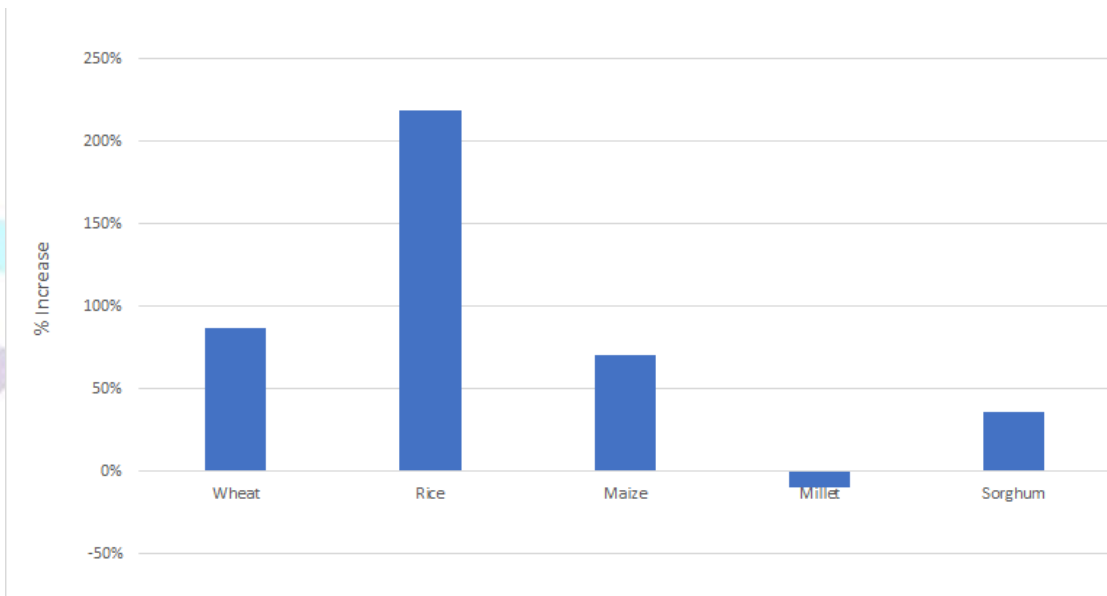
Data source - FAOSTAT

Figure 8 Growth in food consumption – Sub-Saharan Africa



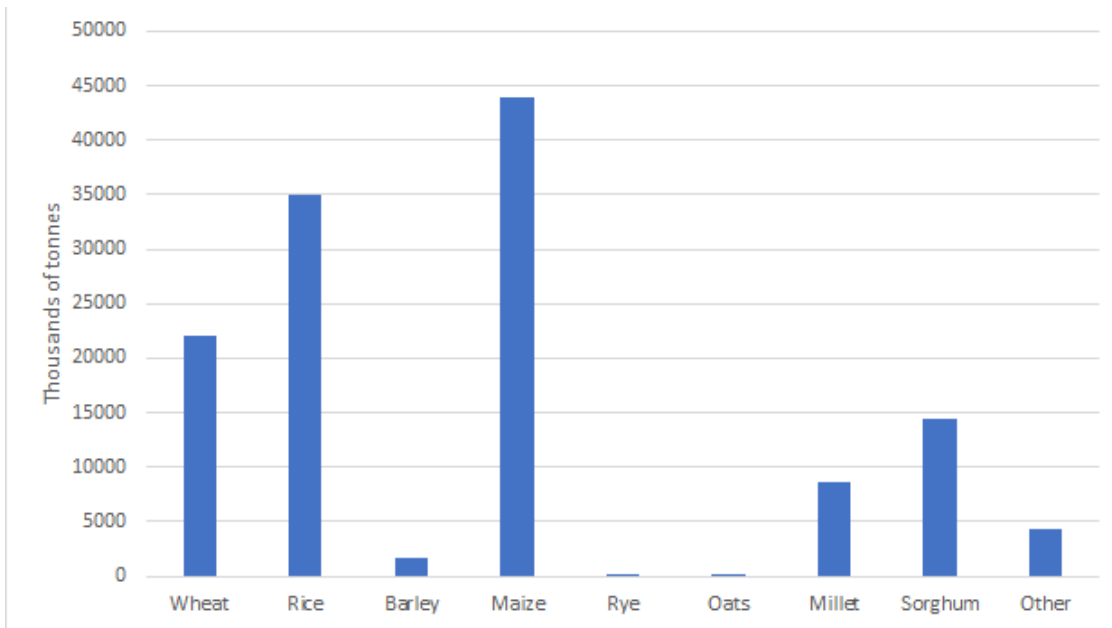
Data source - FAOSTAT

Figure 9 Growth in food consumption – Sub-Saharan Africa (normalised)



Data source - FAOSTAT

Figure 10 Growth in food consumption (2000-2017) - Sub-Saharan Africa



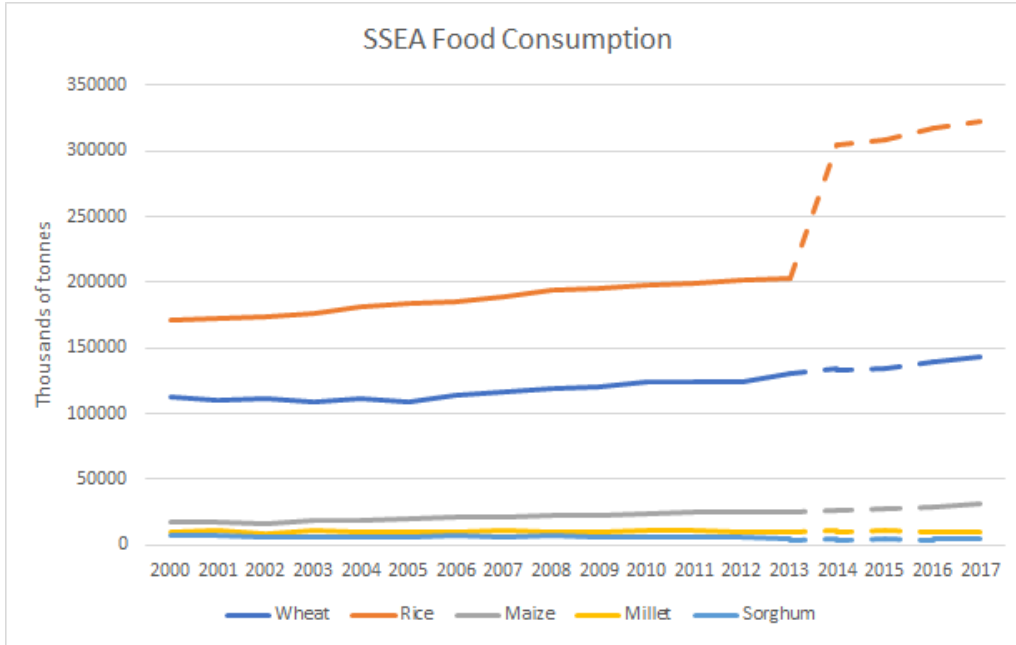
Data source - FAOSTAT

Figure 11 Consumption of grains (2017) - Sub-Saharan Africa

The nutrition transition narrative suggests that developing countries in SSA and SSEA are shifting away from consumption of traditional grains and moving towards more refined, foreign grains. Maize, millet and sorghum were taken as examples of more traditional Sub-Saharan African grains for the graphs above (Raschke & Cheema, 2008). In West African Senegal millet porridge is a traditional staple whilst sorghum is widely consumed as porridge particularly in Central Africa. Traditional maize porridge is widely consumed particularly in East African countries, known as ugali in Tanzania or nsima in Malawi for example. Maize was originally domesticated in Mexico and came to Africa in the 16th century, but it quickly overtook millet and sorghum to become a staple crop in most regions not least because of its higher yields (Cherniwchan & Moreno-Cruz, 2019). Wheat and white rice are examples of more refined crops, primary examples being white rice and bread products.

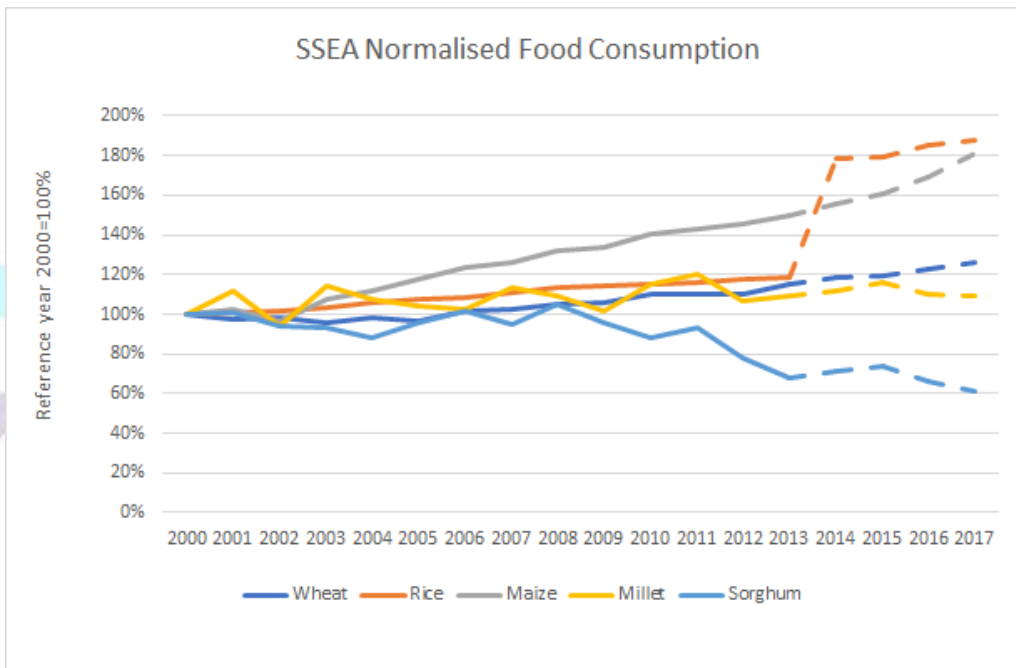
Analysis of FAOSTAT data reveals maize, rice and wheat to be the most consumed crops; in 2017 SSA consumed just under 44 million tonnes of maize compared with 35 million tonnes of rice and around 22 million tonnes of wheat. However, the normalised graph and percentage increase chart highlight the fact that, since 2000, consumption of rice and wheat has been increasing significantly faster. Even if the sudden increase in rice consumption between 2013 and 2014 is ignored, rice and wheat consumption have both risen more than maize has in the time period specified. By contrast, the consumption of millet in SSA decreased by 9% and consumption of sorghum increased by just 36%, not even half as much as wheat. Further, looking at the curve from 2016 to 2017, both millet and sorghum appear to be trending downwards.

These figures demonstrating the rapid increase in consumption of the refined grains wheat and rice in comparison with the slower increase of maize and sorghum and the decrease in consumption of millet support the idea that SSA is experiencing a nutrition transition. Given the important traditional nature of maize in many African cultures, maize consumption cannot realistically be expected to decrease rapidly, but the fact that rice and wheat are increasing significantly faster is an indicator that diets are transitioning.



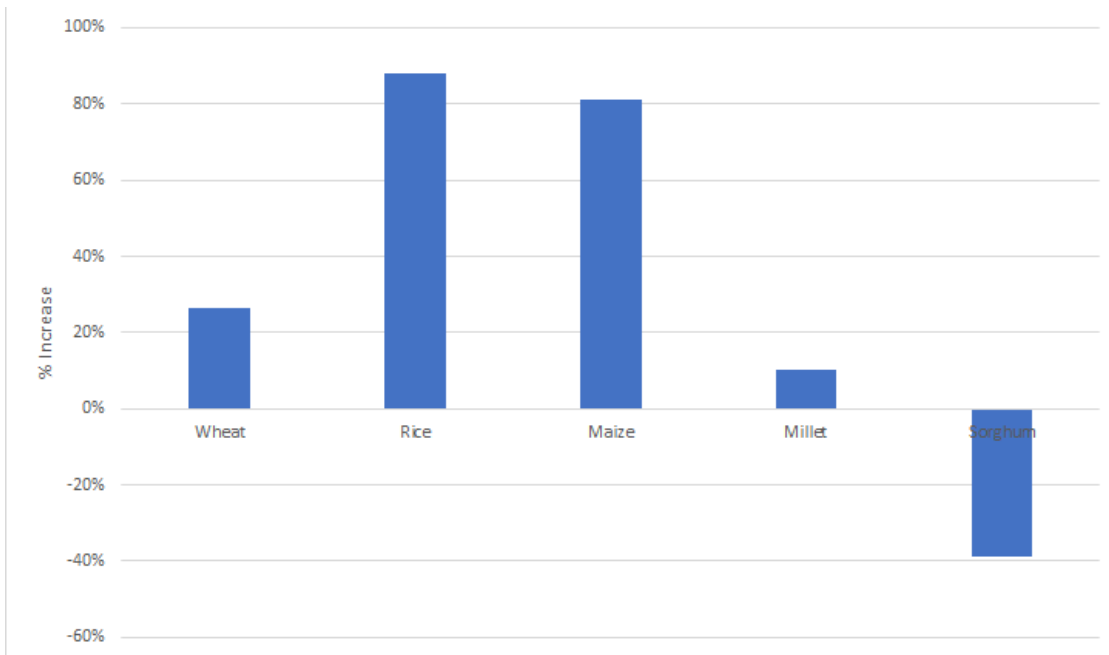
Data source - FAOSTAT

Figure 12 Growth in food consumption – South and South-East Asia



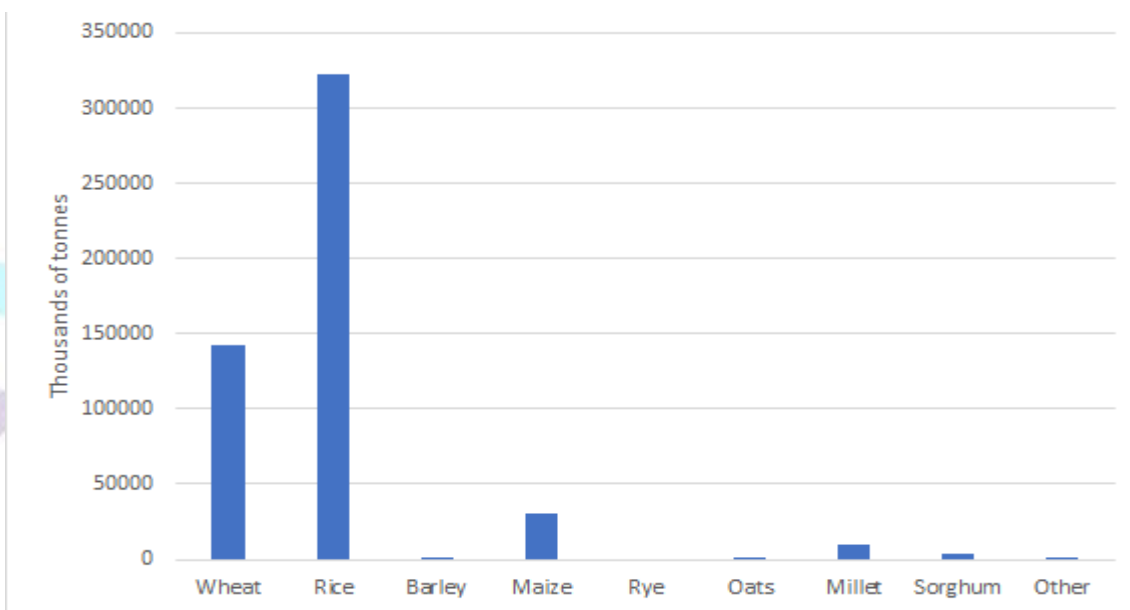
Data source - FAOSTAT

Figure 13 Growth in food consumption – South and South-East Asia (normalised)



Data source - FAOSTAT

Figure 14 Growth in food consumption (2000-2017) – South and South-East Asia



Data source - FAOSTAT

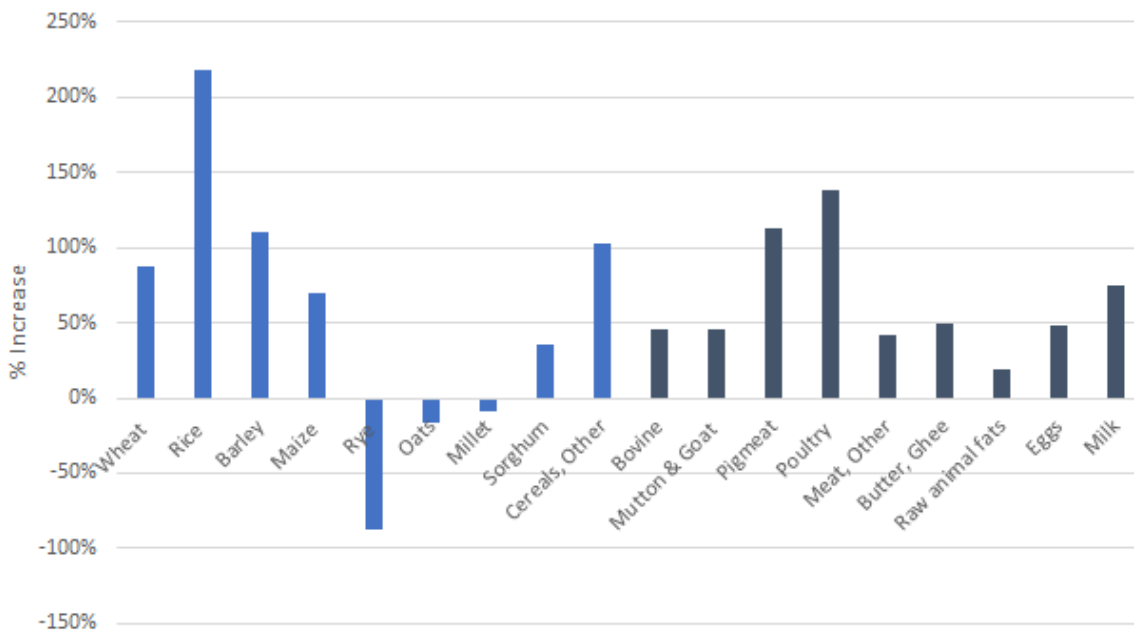
Figure 15 Consumption of grains (2017) – South and South-East Asia

As would be expected, food consumption history and therefore patterns differ slightly in South and South-East Asia compared with Sub-Saharan Africa. Rice has a much richer history and is the primary traditional grain in SSEA (Sharma, 2010), rather than maize, millet or sorghum as in SSA. It could be argued that in order to compare this effectively with the nutrition-transition narrative, one would have to take a different sample of grains. However, as is shown in the graphs above, the top 5 grains consumed in SSEA are rice, wheat, maize, millet and sorghum, just as they are in SSA. It is for this reason that the same 5 grains have been chosen to analyse the effects of the nutrition transition.

Perhaps predictably then, the crop consumed the most in SSEA is also the crop of which consumption has increased the most: rice. Less predictable and less in line with the nutrition transition narrative, at least in the one being observed in SSA, is the huge 81% increase in maize consumption. Looking at the other grains since 2000, wheat has increased 26%, millet 10% and sorghum consumption has decreased by 39%. The fact that wheat has increased significantly more than millet or sorghum reflects the increasing demand for bread and other refined wheat products over the more nutrient dense millet or sorghum. According to older FAOSTAT balance sheets, in 1961, around 7.5 million tonnes each of maize, millet and sorghum were consumed. Since then, maize consumption has increased over 300% compared with millet's 36% and sorghum consumption has decreased 43%. In comparison, rice consumption has increased almost 400% and consumption of wheat 522% since 1961.

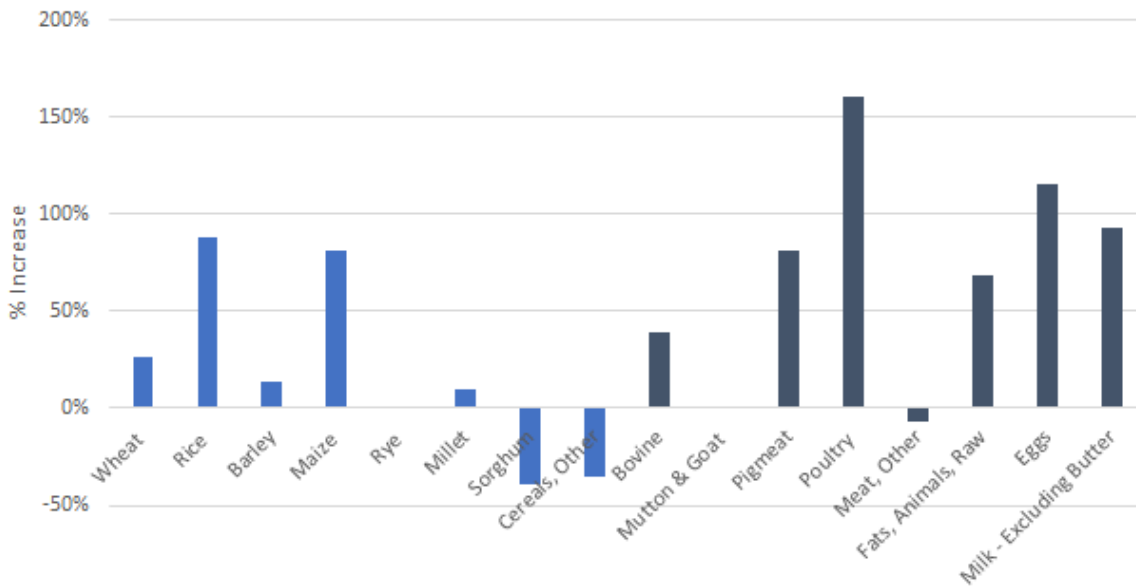
Whilst the large percentage increase in maize could be considered an outlier to the nutrition transition narrative, absolute increase in the consumption of maize in comparison with rice and wheat is exceedingly low. These two refined grains are being consumed more than maize, millet or sorghum and whilst wheat consumption has not increased relatively as much as consumption of maize has, it has still increased significantly more than millet or sorghum. Those two, nutrient dense, traditional grains are increasing slowly or decreasing rapidly in the case of sorghum. This would support the idea that SSEA diets are transitioning to a more refined "Western diet".

SSA Food Consumption Increase 2000-2017



Data source - FAOSTAT

Figure 16 Growth in food consumption (2000-2017) – Sub-Saharan Africa

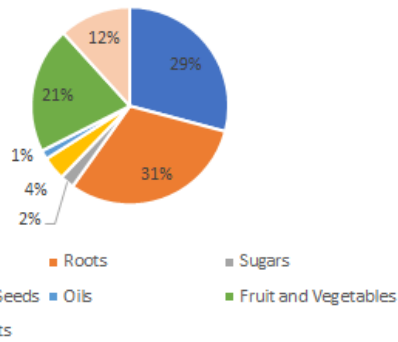


Data source – FAOSTAT

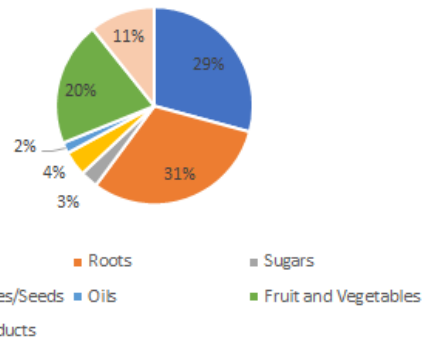
*Oats and butter were excluded as outliers for SSEA; because their consumption was so low in 2000, their increase was disproportionately high.

Figure 17 Growth in food consumption (2000-2017) – South and South-East Asia

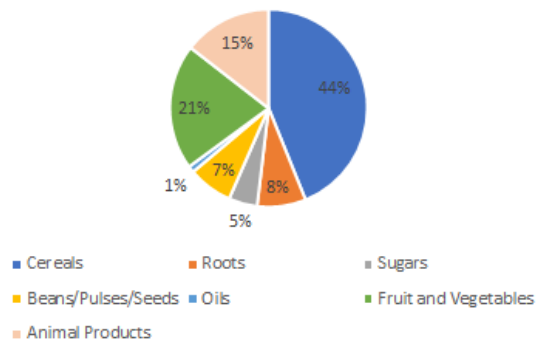
SSA Food Consumption 1961



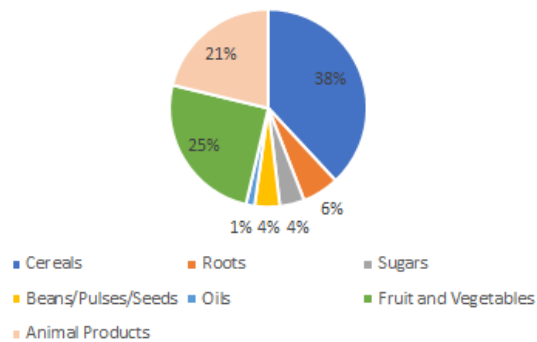
SSA Food Consumption 2017



SSEA Food Consumption 1961



SSEA Food Consumption 2017



Data source - FAOSTAT

Figure 18 Change in composition of diets (1961 and 2017) – Sub-Saharan Africa and South and South-East Asia

Figure 16 to Figure 18 show the percentage increase for particular cereals and animal products between 2000 and 2017, and then the shifts in the proportions of food consumption overall between 1961 and 2017 in SSA and SSEA. As can be seen in fig A, the largest proportional increases between 2000 and 2017 in SSA were in rice, poultry and pig meat whilst in SSEA these were in poultry, milk and eggs. This would appear to support the nutrition transition narrative in both of these regions, with rice and animal products having increased fastest. However, upon examination of fig B showing the percentages as a proportion of diet it can be seen that whilst sugar and oils have both increased by 1% in SSA, animal products have in fact decreased as a proportion of food consumed from 12% to 11% between 1961 and 2017. Although animal products have seen some high percentage increases, their proportional consumption in relation to other foodstuffs has slightly decreased which does not support the idea that people in SSA are consuming animal products at the expense of other foods. That said, in SSEA we can see that animal products have significantly higher percentage increases than the cereals between 2000 and 2017, and can also see an increase proportional to other foods consumed. Importantly, the proportion of animal products consumed has risen from 15% to 21% whilst cereals has decreased by 6%, beans/pulses/seeds by 3% and roots by 2%.

Whilst the diet transition away from cereals and pulses towards more animal products is clearly evident in SSEA, this is not so for SSA. Although consumption of sugars and oils have marginally increased proportionally, consumption of animal products as a proportion of diet has actually slightly decreased.

4.2 Drivers of change

Eating habits are changing. The nutrition transition describes the process being observed in many developing nations of a traditional, nutrient-rich diet becoming increasingly processed, high in fat, sugar and salt in particular. Exactly what is behind this transition?

A review of existing literature on the subject of why people change what they eat brings up several driving factors behind eating habits. There are studies suggesting that human beings have an innate preference for sweet and fatty foods (Popkin, 2003), (Reed & McDaniel, 2006) and that the developing world in particular is experiencing an increase in demand for food to be convenient (Haggblade & Dewina, 2010), (Allen et al., 2018), (Staatz & Hollinger, 2016). Rapid urbanisation and an increase in disposable income has been associated with an increase in consumption of imported and processed foods at the expense of more traditional, nutrient-dense staples (Popkin, 2003), (Dapi et al., 2007), (Muyanga et al., 2006), (Oniang'o et al., 2003), (O'Neill, 2015). The urban growth being experienced throughout the developing world is a honeypot for foreign investment, and the liberalisation of trade has allowed international corporations to flood local food markets with cheap, processed, aggressively-marketed goods (Kearney, 2010), (Hawkes, 2005), (Clapp & Scrinis, 2017). In the discussion below, when the term "processed" is used without any further clarification, this is due to a lack of further definition in the source used.

This section will be split into subsections of Taste, Convenience, Economic Development and Urbanisation, Retail Markets and Trade Liberalisation. The purpose of this order was to move from driving factors at the consumer level up to decisions made on a national level. It would be exceedingly difficult to name a single factor from this list that has influenced food habits above the others due to the inevitably interconnected nature of these driving factors.

4.2.1 Taste

It should not come as a surprise that the taste of a certain food will influence how likely you are to eat it and in fact various studies have been conducted on the human sweet tooth in particular. A preference for sweet-tasting food is a phenomenon observed around the globe (Popkin, 2003) and of all flavours, sweetness is the most universally liked (Reed & McDaniel, 2006). One only has to look at the impressive growth in the soft drinks industry as evidence for this. Mennella (2014) observes that the preference for sweet foods is clearly evident in infants in a study in which a sucrose-sweetened latex nipple “produced stronger and more frequent sucking responses” than regular breastmilk. The sweetened solution resulted in infants relaxing and occasionally smiling. A biological preference for sweet food is clearly an important driving factor for the increasing consumption of sweet foods in developing nations. x



Furthermore, a study done among adolescents in rural, poor urban and rich urban areas of Cameroon reiterates the importance of taste influencing food choice (Dapi et al., 2007). Across the locations all participants noted “tasty” and “sweet” as reasons why they liked their favourite foods. Given that some of the driving factors for their food choices were the same, it is interesting to see how the participants’ favourite foods varied depending on where they lived. Rural adolescents stated their favourite foods were the likes of cocoyam and bean cake whilst at the top of the list for the urban poor were things like rice and meat. In the rich urban area adolescents liked rice and meat, but also candies, bread and doughnuts (Dapi et al., 2007). This study suggests that rural dwellers are more likely to prefer traditional, less processed foods whilst their urban peers have a taste for more highly processed treats. Preference for sweet-tasting foods appears innate in children, and sweetness has been shown to be an important factor in choice of food; taste is clearly an important driving factor of food habits.

4.2.2 Convenience

A recurring factor driving food choices globally, but especially in the developing world, is convenience. Rapidly urbanising populations are increasingly demanding food that is quick and easy to both prepare and consume as they transition into increasingly busy lifestyles.



The demand for convenience is experienced most acutely in the urban environment as consumers become more willing for some of the food processing to be done elsewhere in order to save themselves time (Haggblade & Dewina, 2010), (Minerals, 2018). This is strongly associated with a rise in the number of women in the urban workforce (Reardon et al., 2012), (Tull, 2018). Given that traditionally it is women who are tasked with household jobs and food preparation, an increase in the demand for their time leads to a consequent increase in the demand for convenient and processed foods; households choose to cook foods which take less time (Reardon et al., 2012), (Tull, 2018).

In Kampala, Uganda, a study was conducted on the “determinants of fast food consumption”. Of 300 participants, it was revealed that 90% of them consumed fast food and did so primarily because of its convenience and taste (see pie chart below) (18). Nigeria’s increasing demand for convenient processed foods can be seen in its instant noodle market which grew a massive 11% each year between 1998 and 2011, and currently sits as the 11th largest instant noodle market in the world¹¹ (Haggblade & Dewina, 2010). In East and Southern Africa, a study reveals that across income classes processed foods make up more than 40% of

¹¹ <https://instantnoodles.org/en/noodles/market.html>

household food budgets, a figure that ranges from just over 30% for the poorest to almost 80% for highest income households. However, the figures for processed food as a percentage of purchased food (as opposed to individual production) are much closer being 66% and 86% for the lowest and highest income households respectively (Sarma & Pais, 2008). This study differentiates between “unprocessed” food, which has undergone nothing more than removal from the plant and in some cases drying (e.g. fresh fruit or whole grains) and “low processed” foods which satisfy only one of the following: “have multiple ingredients; underwent physical change induced by heating, freezing, extrusion or chemical processes; and have packaging more complex than simple paper or plastic” (e.g. milled grains, butchered meat). If a product satisfies more than one of these criteria it is classified as a “high processed” food (e.g. bread, vegetable oils); “processed” encompasses both low and high processed categories (Sarma & Pais, 2008).

Convenience is clearly an important driving factor when it comes to eating habits, and we have seen how urbanisation impacts this. Because of increasing time pressures, consumers are more willing to buy food that has been processed elsewhere, making it more convenient for them to cook and eat. This is exemplified in the explicit naming of convenience as a reason for consuming certain food in Kampala, the immense growth of the Nigerian instant noodle market and the general proportion of processed foods consumed increasing with income across East and Southern Africa.

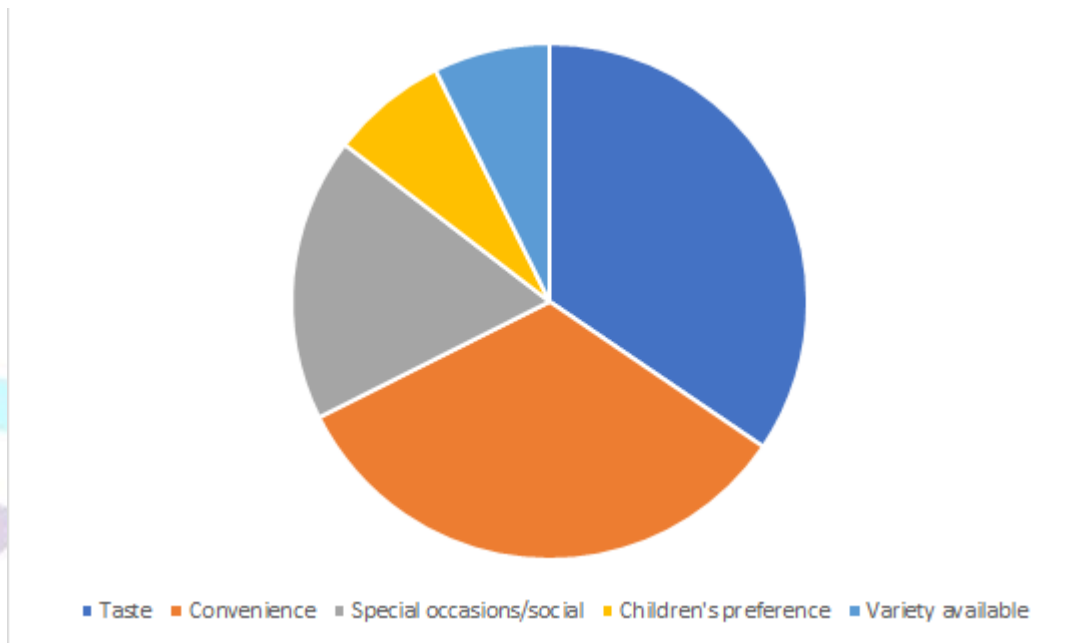


Figure 19 Reasons for consuming fast foods in Kampala (Ayo et al., 2012)

4.2.3 Economic Development and Urbanisation

Since 2000, Sub-Saharan Africa has seen an immense population growth of 66%, with a 117% increase in its urban population, the proportion of the population living in urban areas rising from 31% to 41%. Over the same time period, net income per capita has grown over 45%, although both income and urbanisation growth rates are higher in most of the MECS countries of interest (Hawkes et al., 2017). We have seen how urbanisation impacts demand for convenient, processed foods; this section will examine how increased income and urbanisation affects



food consumption more generally. It will look at the positive correlation between urbanisation and consumption of processed grains as well as the exposure to more western diets that urbanisation brings.

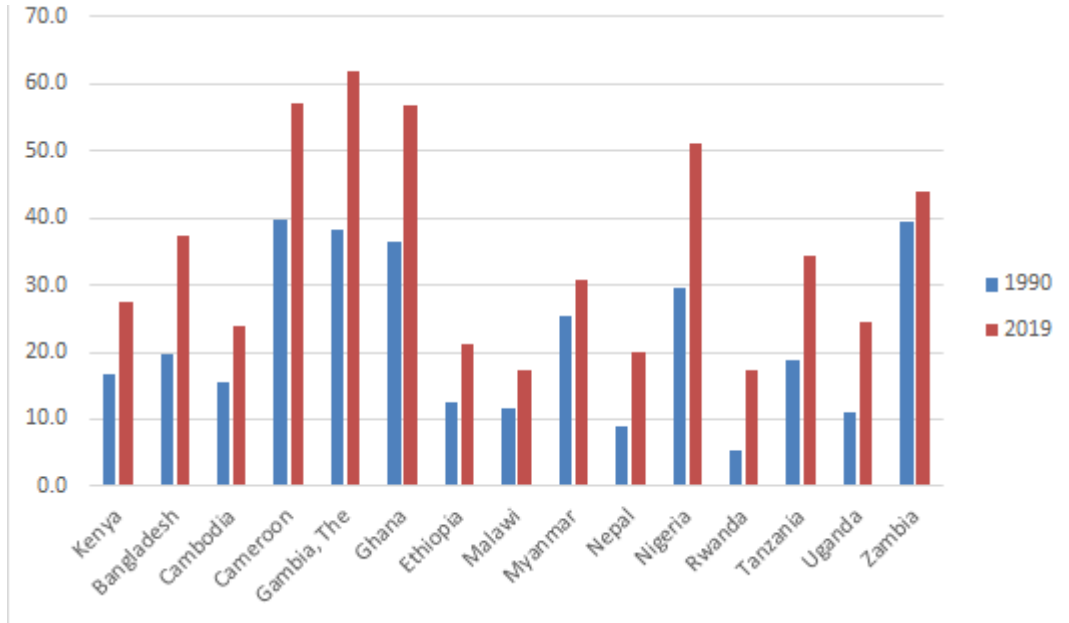
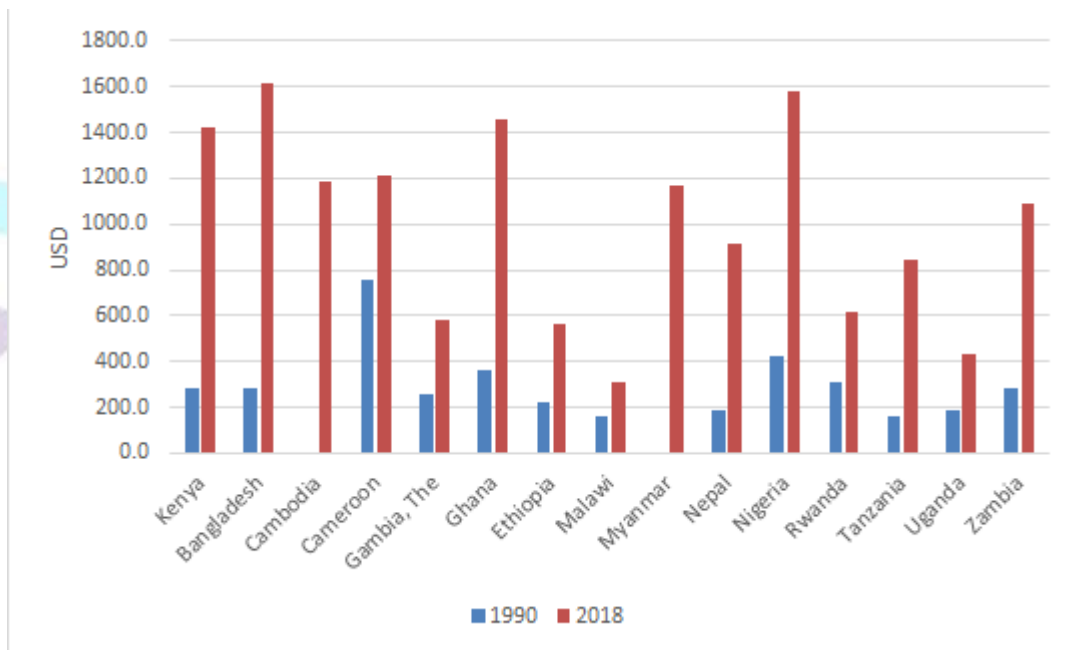


Figure 20 Increase in proportion of population living in urban areas - MECS countries



Source - World Bank

Figure 21 Growth in per capita income - MECS countries

Economic development is strongly associated with the transition from agriculture to a predominantly industrial economy. An increase in the modernity and use of technology means that production rises which results in higher returns for both employers and employees. Consequently, as a country's economy develops, its urban

population grows at a higher rate than its rural population as people migrate to urban areas in order to find higher-paid work.

As examples, the net income per capita in Nigeria has increased by 84% and Kenya by 57% since 2000, considerably higher than the average of 45% for SSA as a whole. In urban Kenya, Muyanga et al have shown that there is a positive correlation between income and wheat and rice products (Muyanga et al., 2006). The higher their income, the more likely an urban adult Keynan is to consume products like “bread, flour, spaghetti, macaroni and pasta”, and consumption of rice also appears to be positively related to income (Muyanga et al., 2006). Oniang’o et al note that in Africa with urbanisation and increased income, consumption of animal products increases (Oniang’o et al., 2003), in particular consumption of milk and meat, whilst in the developing world as a whole it appears that increasing incomes are being used to purchase additional “higher-fat foods” (Popkin, 2003).

The urban population throughout SSA has increased by 117% overall since 2000, but in Uganda this figure is 208% and in the Gambia almost 300%. Because the two are very closely linked, there is a similar positive correlation observed as with income; urbanisation means individuals are more likely to consume wheat and rice products (Muyanga et al., 2006). Whilst for rural communities and the urban poor in Kenya maize remains the staple, in the top 40% of the urban income distribution wheat is consumed more (Muyanga et al., 2006). The urban middle class are “frequently enjoying bread and wheat-based convenience foods, as well as rice” and make up the majority of meat consumers as well (O’Neill, 2015).

As previously discussed, urbanisation clearly affects the demand for convenient, processed foods (milled grains, packaged foods) because of increasing pressures on time and women’s time in particular (Reardon et al., 2009), but urbanisation further vitally influences consumer exposure to new and processed foods. As will be discussed in detail in another section, an urban environment is an attractive place for Foreign Direct Investment (FDI) and modern marketplaces as a whole. Because of the sheer number and concentration of potential customers, the modern retail sector in urban areas is growing incredibly rapidly which means that urban populations have access to an increasing variety of food outlets (Hawkes et al., 2017). Particularly when it comes to electronic media and marketing, this means that urban consumers are experiencing a much broader exposure to a whole range of international food habits. They possess the necessary capital and the access to these new, often processed, foods (Staatz & Hollinger, 2016).

Income and urbanisation are positively correlated with consumption of more processed grains like wheat and rice, as well as higher-fat foods and animal products. An urban environment means a greater demand for convenience, and it also means greater exposure to international food habits and greater access to processed food products. These factors help to explain why the nutrition transition away from traditional, nutrient-dense staples and towards more western, processed foods is taking place.

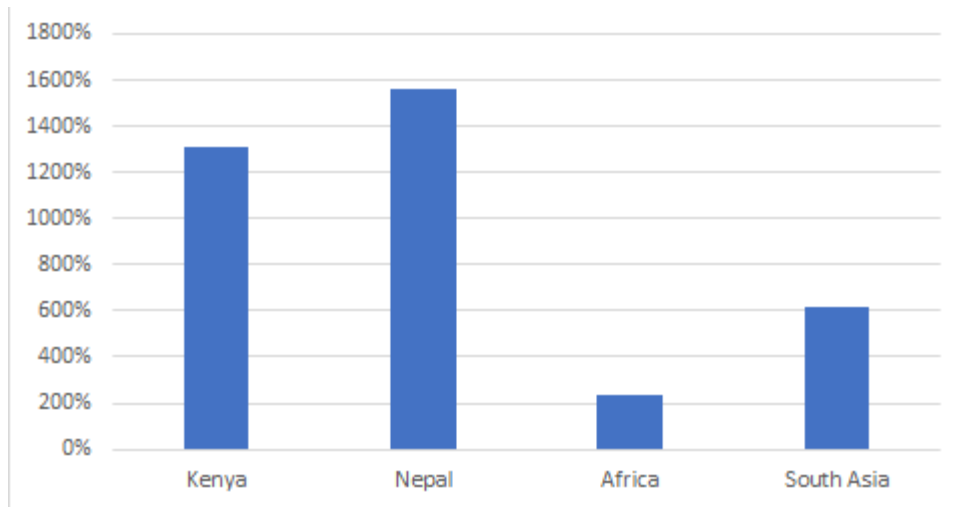
4.2.4 Retail Markets

It has been mentioned above that urbanisation and economic development attract Foreign Direct Investment (FDI) because of the concentration and increasing buying power of urban populations. Figure 22 shows percentage increase in FDI into Africa and South Asia between 2005 and 2019, with Kenya and Nepal taken as two specific cases¹². The data shows that FDI in Africa has increased 239% and in South Asia a huge 619%. Much of this FDI is tied with the increasing involvement of Transnational Food Corporations (TFCs) and an increase in the supermarket retail sector and (Hawkes, 2005; Kearney, 2010; Onzere,



¹² <https://unctad.org/en/Pages/DIAE/World%20Investment%20Report/Country-Fact-Sheets.aspx>

2012). Supermarkets tend to offer lower prices for processed foods which influences food choices (26) and TFCs market their products aggressively (Clapp & Scrinis, 2017; Hawkes, 2005).



Source - UN Trade and Development fact sheets 2020

Figure 22 Increase in foreign direct investment (2005-2019)

Emerging markets in developing countries have far more growth potential than established markets in more developed countries due to the emerging buying power of their growing populations (Hawkes, 2005). Hence, TFCs are understandably investing overseas in order to benefit from the potentially high returns. This investment “makes more processed foods more available to more people. It enables lower prices and opens up new purchasing channels” (Hawkes, 2005). TFCs like Nestlé or KFC are able to enter a market with the resources to establish retail outlets and market their products effectively given the greater access to modern mass media in urban areas (Kearney, 2010). Inevitably with international involvement and improved marketing this “results in the globalization of food consumption patterns” (Kearney, 2010).

As well as increasing consumption of modern, foreign processed foods, TFCs like KFC or McDonalds, often facilitate the creation of processed versions of dishes native to their host country (Kearney, 2010). In Nigeria where jollof rice is a popularly-consumed local food, KFC have their standard chicken, but have also added their own spin on jollof rice to their menu¹³. Traditional diets are being transformed into the “fast-food calories-rich pattern of developed countries” and advances in food processing means they’re competitively priced (Kearney, 2010).

A way that TFCs further influence food consumption is their marketing; as they aim to create demand, their advertising tends to be aggressive and especially targeted towards the younger generations (Hawkes, 2005). Many global brands entering a market are already well recognised, but also buy up known local brands to benefit from an existing customer base (Hawkes, 2005). TFCs tailor their advertising to specific regional markets, and even promote the reformulation of products, for the most part in response to growing health concerns (Clapp & Scrinis, 2017). Across West and Central Africa for example, Nestlé advertise and sell Maggi bouillon cubes

¹³<https://www.africaoutlookmag.com/industry-insights/article/210-unlocking-africa-inside-kfc#:~:text=The%20global%20fast%20food%20giant,for%20more%20than%2040%20years.&text=By%20the%20end%20of%202012,%2C%20Ghana%2C%20Kenya%20and%20Zambia.>

which have been fortified with iron to address the widespread iron deficiency in the region¹⁴ (Lawton, 2005). The Maggi brand has “cooking caravans” which tour Cameroon, the Ivory Coast and Nigeria providing education on topics like “balanced diets, micronutrient deficiency, and the importance of culinary hygiene” (Lawton, 2005). In this instance, Nestlé is providing both education on the problem of micronutrient deficiency and selling its own products as the solution.

TFCs are further aware that buying habits vary depending on the resources of a population. In much of Africa people lack both the income and refrigeration capabilities to buy food in bulk and so products are adapted to single-serving packages. In Cameroon, for example, Nestlé’s Nido powdered milk is most popularly sold in 26 gram packages, which is the precise amount necessary for one glass of milk (Lawton, 2005). On top of this, whilst the rise of supermarkets has been incredibly important in urban areas for the consumption of processed foods, a large proportion of sales continue to go through local traditional retailers (Clapp & Scrinis, 2017; Gómez & Ricketts, 2013; Mennella, 2014). TFCs are harnessing the power of these local, small-scale distributors to access the most low-income consumers who “represent a low-margin but high-volume market” (Clapp & Scrinis, 2017). In Bangladesh, for example, Nestlé has a boat which regularly delivers its products to around 200 small, local retailers in remote communities often affected by flooding to ensure that their shelves are stocked (Lawton, 2005).

However, the evidence shows that the percentage of food being sold through supermarkets in Africa, particularly in urban environments, is growing (Neven & Reardon, 2004; Onzere, 2012; Reardon et al., 2012; Tull, 2018). The primary advantage of supermarkets and larger retailers is their scope; they are able to stock a huge variety of products which has meant that the retail market has shifted from a seller’s to a buyer’s market (Neven & Reardon, 2004). Retailers have to fight for customer loyalty. Supermarkets in Kenya have been shown to offer lower prices for processed foods by an average of 5%, and there is a direct correlation between supermarket shopping and consumption of processed foods (Neven & Reardon, 2004; Rischke et al., 2015). Supermarkets facilitate the consumption of processed foods because of their ability to provide low prices.

The increase in FDI and rise of supermarkets in developing countries have made processed foods much more available and at affordable prices. TFCs use their resources to aggressively market their products to emerging markets and supermarkets encourage the consumption of processed foods with lower prices, which contribute to the overall transition towards more processed diets.

4.2.5 Trade Liberalisation

The previous section looked at the effects of Foreign Direct Investment (FDI), Transnational Food Corporations (TFCs) and supermarkets on food consumption; this section will look at how trading policy and trade liberalisation in particular has influenced this. Free trade lowers barriers to developing economies which allows foreign products to enter their markets whilst the nature of economic structure tends to favour larger corporations (Raschke & Cheema, 2008). Also important to consider are the cash-crop economies encouraged by old colonial powers which have reduced availability of traditional crops (Raschke & Cheema, 2008).



Trade liberalisation removes many of the barriers to foreign investment in a country’s food market, enhancing the expansion of processed food markets (Kearney, 2010; Thow & Hawkes, 2009). A case study conducted in Central America reveals the direct correlation between the liberation of trade policies and an increase in the availability of “rice, animal feed and fresh apples” (Thow & Hawkes, 2009). Much of the African continent went

¹⁴ <https://www.nestle.com/stories/maggi-cubes-fortified-foods-vitamins-iron-anaemia>

through the process of trade liberalisation between 1980 and 2000, significantly reducing their barriers to imports (Kopperschmidt, A; Matutes, 1997), (UNEC, 2003) which facilitated the increase in FDI observed previously. Given the ability of especially large international corporations to buy and supply in bulk, as well as their ability to go elsewhere in search of cheaper labour, they are often able to provide cheaper products than local retailers. The consumer has the power to choose where they shop and price being a major driving factor behind consumer buying habits means that economies tend to favour large corporations (Raschke & Cheema, 2008).

Further, many farmers in previously colonised countries were “encouraged by the British to grow food crops for export in order to earn money” (Raschke & Cheema, 2008). This resulted in the creation of cash-crop economies in the 1950s, where instead of growing their traditional, nutrient-dense crops, farmers grew things like coffee, cotton and peanuts for exporting to western markets (Raschke & Cheema, 2008). Whilst this has clearly had a range of social implications, it has also affected the nutrition transition as it means that traditional staple grains are much less readily available (Thow, 2009).

The liberalisation of trade policy has had a clear impact on the nutrition transition, opening the doors of developing markets to FDI which has facilitated the increased consumption of processed foods at the expense of traditional, nutrient-dense grains.

5 Processed foods

5.1 The food processing industry in developing countries

The state of a domestic food processing industry provides a direct insight into the level of technological, social and economic development within the country (Chapter et al., 2008). The food processing sector has an impact on food security, loss and waste; energy demand; public nutrition and health; national and multinational economics.

The global sector has undergone change in its structure in the last half century. In most low-income countries during the 1970s and 1980s, food processing of grain and meat was provided by partially or wholly state-owned processors. Liberalisation followed, disintegrating the predominantly state-owned sector into a large number of small and medium sized private processors. Either side of the millennium, the sector witnessed a growing number of acquisitions and mergers as multinational foreign direct investment (FDI) affected the processing sector (Reardon et al., 2009). Multinational companies realised that investing overseas could be a profitable strategy. In 2000, US investment into overseas food processing industries yielded sales that were five times higher than the sale of US exports of processed foods (Hawkes, 2005), justifying further investment.

Given demand for processed food items in low-income countries is projected to grow an average of 7% to 8% per year over the next 30 years (Sanga et al., 2018), the sector will have to increase capacity accordingly. Changing weather patterns and flooding risk may influence how and where the sector develops and technological development is set to increase the energy demand of the industry (Mereu et al., 2018). Care must be taken to ensure that the required growth of the food processing sector, and its energy demands, are fulfilled in a way which minimises its contribution to global warming. For, the resulting changes in climate constrain the agricultural foundation on which the industry is based.

5.2 Extent of the Food Processing Industry

Where processed food's contribution to total manufacturing output has been postulated, the extent is assumed to be an underestimate; most notably in low-income countries where informal trade is only partially represented (Wilkinson & Rocha, 2008). Although data on the market values of packaged and processed foods are available (e.g. Euromonitor), some literature points out that detailed information on the extent of food processing (processed food imports, domestic production and retailing information) is scant as this is seldom recorded in official statistics (Andam et al., 2018). Also, lists of formal processors do not exist, as evidenced in a study of Tanzanian, Kenyan and Ugandan millet and sorghum processors (Schipmann-Schwarze et al., 2015). Some processing firms publish the number of factories per country as in Nestlé's annual report (Nestlé, 2019). This practice is not universally adopted and hence does not fully represent the extent of the sector. Furthermore, no information is given on the factories' processing capability. The number of factories as a metric for the extent of the processing industry may not be fully explanatory. The amount of food a country processes is not linearly related to the number of factories as each factory will have a different output capability. Additionally, the number of factories may be different from the number of operational factories. In Bangladesh, evidence showed that of the 130 processing factories located, only half were in operation (Islam, 2008). It is also common that factories may not be working at full capacity (Schipmann-Schwarze et al., 2015).

Food processing facilities, within a country, are disproportionately represented in capital and major cities (Cockx et al., 2019a). In part, this leads to an increased access to processed food in urban areas when compared to rural areas (Codjoe et al., 2016). Evidence from Ghana suggests that there is a positive correlation between the size of a city and the availability of processed food (Andam et al., 2018). This distances rural producers from the opportunity of processing. The transport required to reach the processing facilities often result in food loss and hence lower profits (FAO, 2016). Evidence suggests that direct contracts between distant farmers and processors are rare; owing to the time consumed, additional costs and unreliability of these arrangements (Schipmann-Schwarze et al., 2015).

5.3 Drivers of change

5.3.1 Impact of Foreign Direct Investment and the "Supermarket Revolution"

Foreign Direct Investment (FDI) was mostly absent in the food processing sector before 1990. Its emergence in low-income countries' food processing sectors arose mainly due to intense competition and saturation in European, US and Japanese markets, as well as established markets within the same region such as South Africa, Hong Kong and Costa Rica (Weatherspoon & Reardon, 2003). This, coupled with the opportunity to make higher profit overseas (Hawkes, 2005), incentivised the "massive inflows" of FDI that multi-nationalised the industry (Reardon et al., 2009) and intensified competition, resulting in a sector owned by large national or international firms (Mather, 2005).

FDI also altered the way food was accessed. A "supermarket revolution" was catalysed (Reardon et al., 2009), (Sanga et al., 2018), driven in part by FDI (Mereu et al., 2018). Supermarkets are now commonplace in large cities in low-income countries and they represent an ever-increasing share in the way food is bought. Processed food is favoured by supermarkets as they benefit from economies of scale, and they offer a greater variety and lower cost (Monteiro et al., 2013), (Weatherspoon & Reardon, 2003), (Sanga et al., 2018). More processed food is evident in the diets of Kenyan supermarket users than those who shop at traditional markets (Kimenju et al., 2015). Supermarket prevalence, owing partially to FDI, has thus increased the extent and reach of food processing – with supermarkets acting as the "middle agent" between global processed food suppliers and urban consumers (Andam et al., 2018).

Small to medium size food-processing companies and producers are frequently maladapted to the demands of the supermarket and can face exclusion (Weatherspoon & Reardon, 2003). Often, they are unable to adhere to the private safety regulations and consistent quality, volume and process requirements that larger companies can more easily obtain (Mather, 2005). Kenyan, Tanzanian and Ugandan supermarkets all practised fixed prices and delayed payment to flour processors in these countries. This meant that the processors could not adapt price to the availability of raw supply or buy raw material on credit (Schipmann-Schwarze et al., 2015).



Figure 23 Melcom in Accra, Ghana CC-BY-2.0 Ziad 2014

Although it is unclear as to whether supermarkets trigger domestic development, upgrading and modernising value-added chains has been shown to occur domestically. That is, without the influence of exports and supermarkets (Verhofstadt & Maertens, 2013). For local and domestic markets, focusing on mechanisation of traditional techniques, small-scale processing plants have been shown to be more successful as O. Charles Aworh describes (Chapter et al., 2008):

“It is clear from experiences with large, fully mechanized processing plants in Nigeria and other West African countries, that small-scale food industries, involving limited mechanization of the traditional methods of food processing, with possibilities for replication in the rural areas where the raw materials are produced, offer better prospects for success. Full mechanization often results in higher overhead costs. In addition, small-scale plants have the advantage of being able to match processing capacity with raw material supply and are, therefore, less adversely affected by raw material shortages than large-scale food industries.”

5.3.2 Incentives and Policy

Domestic food processing can add value and compete against imports. This has encouraged most African states to invest into the sector, as evidenced in Ghana’s continued state support of cassava and tomato processing. Despite this, imports have a greater presence in the processed food market than domestic processing in Ghana’s cities (Andam et al., 2018). Typical policy instruments used to support the sector include tax, fiscal & government incentives; electricity, freight & capital subsidies; and a variety of industrial and local development schemes (MOFPI, n.d.). All of which aim to increase the domestic supply of processed foods. Where government building schemes have included increasing food processing capacity, some have failed owing to corruption and an absence of commitment, as is evident in Nigeria’s ‘National Rolling Plan’ (Ogen, 2007). During the 90’s in Nigeria, unrealistic project scopes, poor management and political instability led to public investment being misdirected into a few private hands via inflated contracts and over invoicing (Ukah, 2008). Increasing the capacity of

domestic food processing could require private and public investment to joint finance projects (Mereu et al., 2018). One such example is the International Development Research Centre’s (IDRC) pre-cooked bean project in Uganda and Kenya (Ugen et al., 2017). Government intervention has been called for in helping small to medium sized private processors make the necessary investments required to have access to the supermarket which could not be otherwise achieved via incremental growth (Mather, 2005). Governmental promotion of local processing for export and domestic consumption is postulated to be able to create more employment opportunities and income in Nigeria, for example (Ogen, 2007).

5.3.3 Data on the Extent of the Food Processing Industry

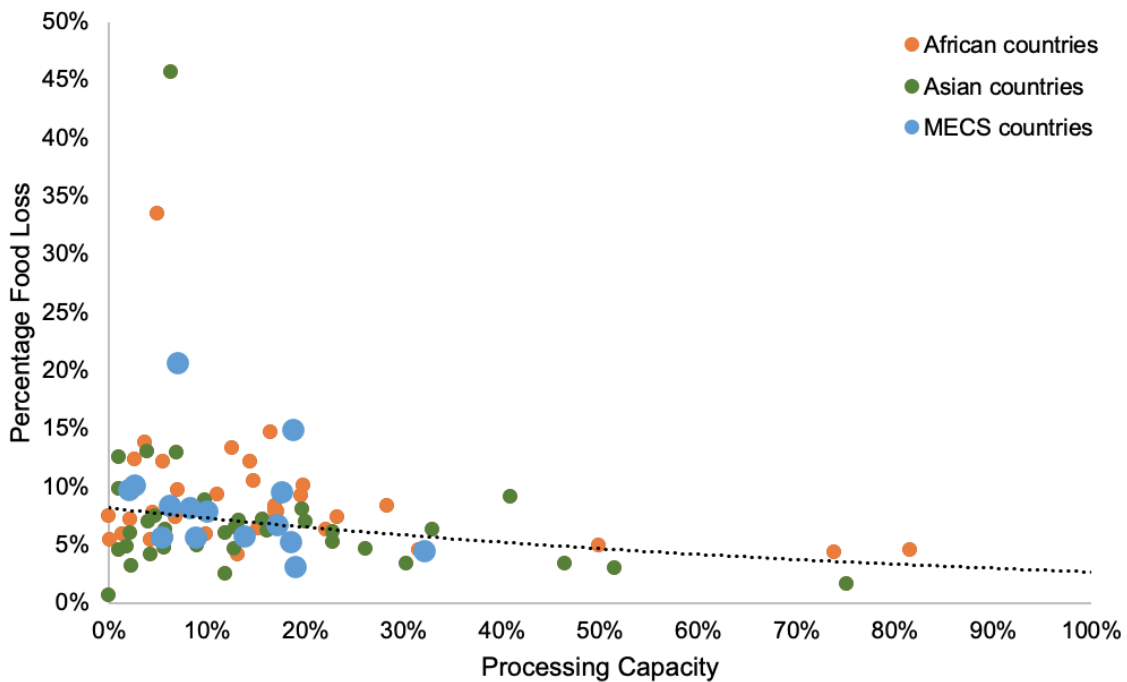
For the purposes of the following analysis, processing capacity has been used as a measure of the extent of domestic food processing and is defined as:

$$\frac{\textit{Processed} \times 100}{\textit{Production}}$$

FAO provides statistics on processed and produced food, segregated by ‘aggregated items’ on FAOSTAT. To determine the processing capacity of a nation, every aggregated item’s total¹⁵ was summed to give a total processed and produced value in tonnes, for a given country, in the year 2017. The subsequent division of these totals gives a nation’s processing capacity. This quantity measures the ability of a country to process the food it produces and imports. A country with 0% processing capacity undertakes no processing of the raw food it produces or imports, and will thus export unprocessed/minimally processed food and demand for processed food will be wholly fulfilled by imports. On the contrary, a country with 100% processing capacity processes all of the food that it produces or imports. It will likely export high value added processed food and rely little on processed food imports.

By dividing by production, the processed food amount is normalised to account for a country’s production ability and land use. The processed metric from FAOSTAT does not, however, specify where the ingredients for the food processing was produced. This limits the descriptive ability of the processing capacity metric. As a broad measure, it can give an indication of how progressed a country’s food processing sector is.

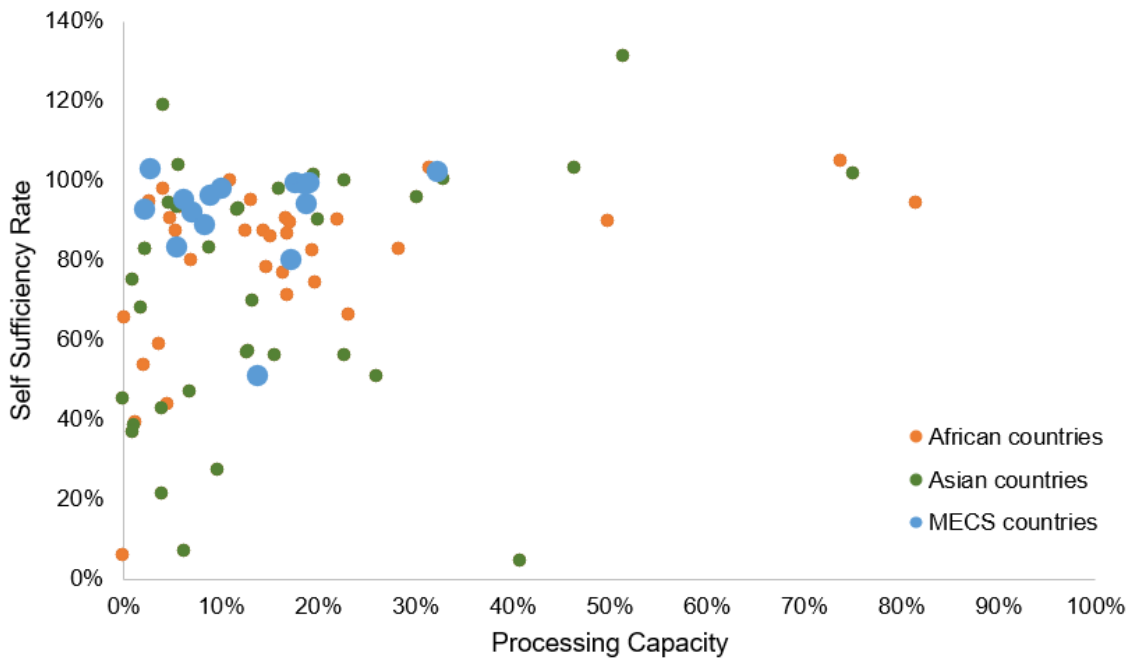
¹⁵ Except Stimulants due to irrelevance



Source: Authors' own based on FAO STAT (2017)

Figure 24 Percentage food loss versus processing capacity for African and Asian countries

Figure 24 shows the variation of percentage food loss with processing capacity. As is also true in Figure 25, 45 of the current 54 countries of Africa and 39 of the current 48 Asian countries are represented. The chosen fit is exponential, reasoning that food loss will never achieve 0 percent, which is consistent with the concept of optimal food loss (see Section 7). The graph shows that the higher a country's processing capacity, the lower its percentage food loss. Food loss percentage is calculated by FAOSTAT's 'Losses' metric divided by the 'Production' metric with the same aggregated groups used to define the processing capacity. Figure 24 shows that processing capacity for most LMICs lies below 20%. Although the percentage food loss in these countries typically ranges from 5% to 15%, the same trend is evident, notwithstanding a few outliers. All the MECS countries except Zambia belong to this group. The number of countries from Africa and Asia that achieve a processing capacity between 20% and 50% decreases to 14, and only four countries have a processing capacity greater than 50%; Thailand, 51.5%; Eswatini (Swaziland), 73.9%; Malaysia, 75.1%; Mauritius, 81.6%. Increasing a country's processing capacity may, therefore, have an effect on reducing food waste.



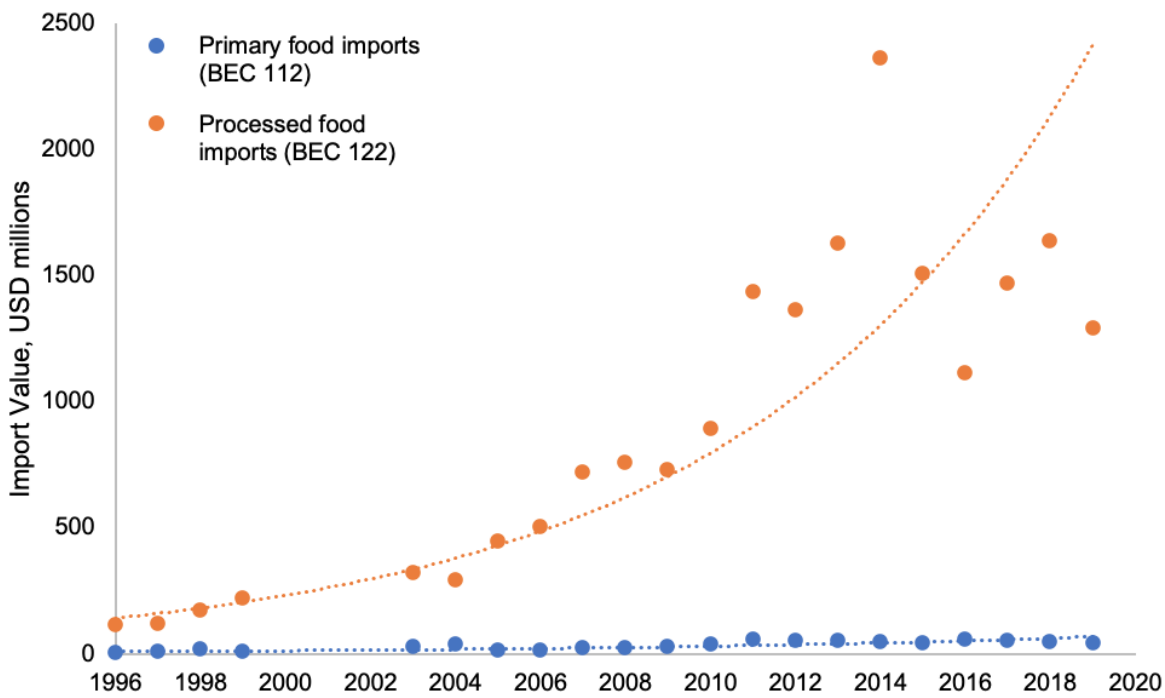
Authors' own based on FAO STAT (2017)

Figure 25 Variation of self-sufficiency rate with processing capacity

The Self-Sufficiency Rate (percentage) gives an indication of how much a country is reliant on imported food and is defined as (FAO, 2015a):

$$\frac{\text{Production} \times 100}{(\text{Production} + \text{Imports} - \text{Exports})}$$

Comparing Self-Sufficiency Rate against processing capacity, Figure 25 shows a trend for self-sufficiency rate to increase with processing capacity and for this effect to be strongest at low processing capacity rates. This implies that even a modest food-processing industry can make a substantial difference to self-sufficiency. The bracket between 0% and 20% processing capacity contains 11 of the 12 countries which have a self-sufficiency rate of less than 50%. The Gambia is the only MECS country with a self-sufficiency rate below 80% in the year 2017. Increasing processing capacity may aid these countries in achieving improved self-sufficiency. As processed food demand is growing (Sanga et al., 2018), countries with a low-processing capacity will fulfil this demand with imports, an increased reliance on which will reduce the SSR. Figure 26 displays the value of imports over time for Ghana, a country whose processing capacity was 7% in 2017. Evident is a significant disparity between the growth in primary (unprocessed) food imports and processed food imports. It is expected that the magnitude of processed food of the value will be higher due to the value-added nature of these products, however, the growth rate of processed food imports is impressively high. Increasing food processing capacity will serve the requirement for processed food domestically, while scope for value added export is also developed.



Authors' own based on comtrade data

Figure 26 Example of growth of processed and primary foods (Ghana)

Table 1 gives detailed data for the MECS countries that were used in the previous graphs.

Table 1 Processing capacity, food loss and self-sufficiency rate for the MECS countries.

MECS Country/Continent	Processing capacity [%]	Food loss [%]	SSR [%]
Cameroon	18.7	14.9	94.2
Ethiopia	8.9	5.6	96.3
Gambia	13.8	5.7	51.2
Ghana	7.0	20.7	92.2
Kenya	17.2	6.7	80.2
Malawi	17.6	9.5	99.6
Nigeria	6.1	8.3	95.5
Rwanda	2.1	9.7	93.0
Uganda	19.0	3.1	99.5
Tanzania	10.0	7.8	98.3
Zambia	32.2	4.5	102.4

Africa¹⁶	15.5	8.7	90.1
Bangladesh	5.3	5.6	83.4
Cambodia	2.6	10.1	103.1
Myanmar	18.6	5.2	99.3
Nepal	8.2	8.2	89.0
Asia¹⁷	22.1	5.6	94.9
Source: Authors' own based on FAO STAT (2017)			

Table 1 demonstrates that, on average, Asia has a greater processing capacity than Africa. As the average is weighted, it is postulated that major producers that are further developed, such as China, Thailand and India, skew the average. All the Asian MECS countries are below the continent average. Cambodia's processing capacity is appreciably low. A study of SMEs in Cambodia suggested that entrepreneurs of many sectors (food processing included) faced constraints from the political situation (Garivait, Bonnet & Kamnoed, 2008). The authors elaborate that people tended to save money during political instability to ensure family safety. A weak financial structure limits the credit banks are willing to loan. Thus, many have to rely on money from family and close friends to engage in a business venture. Myanmar, on the contrary, demonstrates a processing capacity much closer to the continent average and far higher than the other Asian MECS countries. Goletti et al., in 1999, stated that Myanmar was in a better situation than Cambodia to develop and diversify its food- processing industry due to its success with rice production and export, stating that:

"Exports provide the link between farmers and international markets that is one of the main avenues through which diversification can contribute to commercialization of agriculture and income growth." (Goletti & Division, 1999)

The authors also state that the agricultural sector of Cambodia has been drastically constrained by the legacy of the war which has polluted much of the arable land with land mines. Since 2011, economic reforms have encouraged Myanmar's export of value added commodities as DZZ Naing writes: (Naing, 2014)

"Myanmar has been exporting primary products with low price, and importing manufactured and investment goods. The government of Myanmar is actively encouraging export diversification and promoting downstream processing of primary commodities, improving support services in trade financing, market access and trade facilitation as well as removing barriers to inbound foreign direct investment."

WW Kyi states food processing as the "most important source of income and employment in Myanmar". Eighty percent of the labour is employed in agricultural activities and as the population grows, it is the food processing sector that is absorbing these workers (Kyi, 2009). The author describes how, pre-1988, the industrial sector was

¹⁶ Weighted average of the 45 african countries observed

¹⁷ Weighted average of the 39 asian countries observed

monopolised by state-owned enterprises and this constrained value-added manufacture. After a liberal policy was opted for in 1988, the sector has positively developed.

Observing the African MECS countries, a notable outlier is Zambia whose processing capacity is more than twice the African average. Looking at the FAOSTAT data at a higher resolution, sugar production is responsible for 34% of all the country's produce and 89% of the sugar produced is processed (FAOSTAT). Sugar accounts for 3% to 4% of Zambia's GDP and 6% of total exports. Since privatisation in the 1990s, the gross export revenue has almost doubled from USD 25 million to USD 45 million. Zambia is ranked sixth cheapest producer of sugar in the world. A clear monopoly exists in this subsector with Zambia Sugar Plc accounting for over 90% of sugar production (Nugroho, 2013). This expansive sugar sector could influence food processing's contribution to total manufacturing in Zambia, which is estimated to be higher than its fellow Sub-Saharan nations at 60%. Kenya and Tanzania's estimated contribution to total manufacturing from food processing is 40% and 34%, respectively (Charles et al., 2017). All these factors contribute to Zambia having a large processing capacity.

Rwanda, on the other hand, has a severely low processing capacity. The Rwandan government states that, in 2010, agriculture employed 71.6% of the labour force, yet, modernisation and value addition are not fully exploited (Republic of Rwanda, 2012). Rutunga et al. suggest that the foundations of cropping and livestock are not sufficient enough in Rwanda to support the initiation of food processing industries (Rutunga et al., 2007). Research conducted into Rwandan SME pineapple processors suggests:

"Lack of entrepreneurial skills, high cost of water, electricity, high transport cost, limited knowledge and technical skills and inaccessibility to packaging materials and processing equipment were the major constraints identified that the food SMEs faced." (Mukantwali, 2014)

The authors note that many food processing SMEs cannot access governmental financial assistance due to limited information of how to obtain funding. As with Cambodia, war has affected Rwanda's progression in food processing. Before the 1994 civil war in Rwanda, research efforts into the food processing sector were conducted which were subsequently curtailed (Sperling, 1997).

5.3.4 Constraints to the Processing Industry

The constraints to the sector are manifest in four main ways: supply, storage, energy and transport. Kenyan and Ugandan processors of flour highlight the challenges associated with poor supply. Only 42% of Kenyan processors were happy with the quality of grain they received and this was even lower in Uganda at 31%. Many processors in these countries had to invest in cleaning equipment or pay a premium for uncontaminated raw material, acting as a barrier to further development (Schipmann-Schwarze et al., 2015). Processors of beans in Kenya and Uganda rely heavily on imported raw beans for processing due to the limited, and poor quality, local bean production (Cultivate Africa's Future, 2018), (Ugen et al., 2017). Supermarkets have shifted the responsibility of storing inventories of processed food onto the processors themselves (Mather, 2005). Evidence of a lack of storage facilities in Africa is stated as a challenge to the continent's food system (Olaoye, 2014), (Chapter et al., 2008). Food in poor storage facilities is susceptible to insect, fungal and bacterial attack (Oduro-Yeboah, 2016). Often, cold storage could prevent or eliminate this loss. However, a paucity of access to modern energy precludes this progression in storage:

"Due to limited electrification in rural areas, 85% of Kenya's 800,000 plus dairy farms do not have access to refrigerated storage and transportation" (FAO, 2016).

A dearth of storage results in agricultural producers losing two opportunities: to best serve the population's nutrition requirements and to obtain the best value for their produce. Dairy is a sector which is hit particularly hard by the lack of refrigeration. Chilling facilities allow for the large evening milk yield to be preserved and properly marketed. Where this infrastructure is absent, dairy farmers yield lower returns (FAO, 2016). Producers

of highly perishable food groups, such as fruit and vegetables, also suffer. Evidence from Cameroon suggests that the inability to process and preserve culminates in harvest time peaks of produce. Farmers have to sell their produce to saturated markets at a loss. With food processing and storage, the produce can be used as nutrition throughout the year and the market can be stabilised (FAO, 2016). In Tanzania, lack of energy and other physical infrastructure is stated as the main reason for inadequacy in the agro-processing sector (FAO, 2016). A large proportion of value is added at the processing stage of the food cycle. A shortage of domestic food processing in Tanzania results in a significant export of unprocessed products (FAO, 2016), (Wangari et al., 2020). Hence, maximal value cannot be extracted from the product domestically.

Physical infrastructure such as roads and rail are the link between rural producers and urban processing facilities. Where this infrastructure is poor, food spoilage is commonplace (Chapter et al., 2008), (Schipmann-Schwarze et al., 2015). Changing diets have had an effect on this food loss. Most notably, the process of drying makes crops easier to transport. Dried goods have reduced volume and weight which improves storage and shelf life (FAO, 2016). However, in low income countries, shares in the technologies of salting, drying and pickling are declining. In its place is a demand for cold storage and fast transport chains (Mereu et al., 2018), requiring abundant and reliable energy and infrastructure.

Electrification could well revolutionise the food processing sector in low income countries. Its prevalence is limited as explained in the context of Nigeria by Olaoye (2014):

“The majority of Africa’s population resides and obtains their livelihoods in rural areas that house agriculture and traditional Agro-industrial processes, and this is very pronounced in case of Nigeria. Such processes include preservation techniques as sun-drying (e.g. fermented cassava and tempered yam slices for lafun and elubo production respectively, vegetables like pepper, okro, etc.), milling operations such as size reduction of dried yam and cassava cubes or slices) and energy intensive operations, including pulping of vegetables and fruits. These activities could be reasonably accelerated if access to energy is available to run modern equipment to provide fast throughput of samples for processing. Access to modern energy however, is either extremely limited, too expensive or of low quality in rural areas. Electrification rates show that Africa has lower energy penetration than other regions. Such low electrification constrain both Agro-industrial production and the consumption of processed food products, since many agricultural raw materials, especially highly perishable food raw materials, need to be processed within a few hours of harvesting in order to ensure food conservation, food safety and marketability.”

Expanding an electricity grid to rural areas takes a significant amount of time and investment (FAO, 2016). This is a problem which is exacerbated by the lower population density evident in these areas, reducing priority for governments and electricity suppliers. For small-sized farmers, the risk of investment in processing equipment is high. Financing schemes have assisted in overcoming this monetary barrier as in the purchasing of solar dryers for bananas and rubber in Thailand or cold storage solutions in Kenya (Shrestha et al., 2006), (FAO, 2016). Fossil fuels, as well as being unsustainable, are stated as uneconomical in low income countries (Palaniappan, 2009). However, low-cost diesel generators have been used for food processing in Mali and Burkina Faso with a 40% to 50% subsidy (UNDP, 2012).

5.4 Monetary Value of the Food Processing Industry

The food processing industry consists of processed food products and food processing equipment. The latter of which is a large global market in its own right. Conservative estimates project the global market to reach USD 63.74 billion in 2026 at a compound annual growth rate (CAGR) of 5.2%¹⁸. Higher estimates suggest USD 87.3 billion in 2026 at a CAGR of 6.4%¹⁹. In South East Asia alone, the market is projected to reach USD 1,152 million by 2023 at a CAGR of 4.7%²⁰.

Processed food products’ retail value are recorded in Euromonitor’s Passport dataset. This uses the definition of Packaged Food as described in Section 3.

Figure 27 displays the average CAGR of the packaged food market for nine MECS countries between 2005 and 2020. These are the countries for which data are available. These rapid growth rates demonstrate how much more valuable the processed food market gets every year.

Figure 28 explores the average CAGR of individual packaged food market segments differentiated by MECS countries between 2005 and 2020. The growth of the “Rice, Pasta and Noodles” market is consistently high in these nine countries. The “Breakfast Cereals” market and “Processed Meat and Seafood” also show high levels of growth. Cameroon is the only MECS country for which data on the “Ready Meals” market is present. It displays a growth well above the other sectors in Cameroon although its market share, as of the time of writing, is small. Wherever bars are missing for countries, this is due to a lack of data.

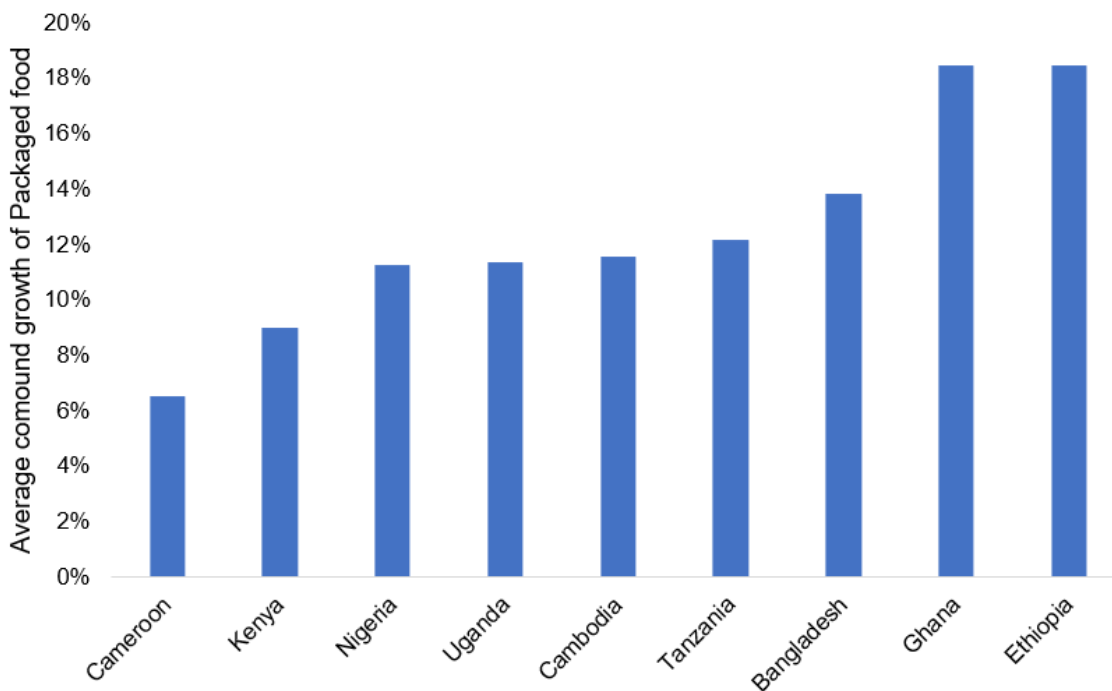


Figure 27 Average annual growth rate of packaged foods (2005-2020) - MECS countries

¹⁸ <https://www.fortunebusinessinsights.com/industry-reports/food-processing-equipment-market-101768>

¹⁹ <https://www.acumenresearchandconsulting.com/food-processing-equipment-market>

²⁰ <https://www.marketresearch.com/Meticulous-Research-v4061/Southeast-Asia-Food-Processing-Equipment-11781376/>

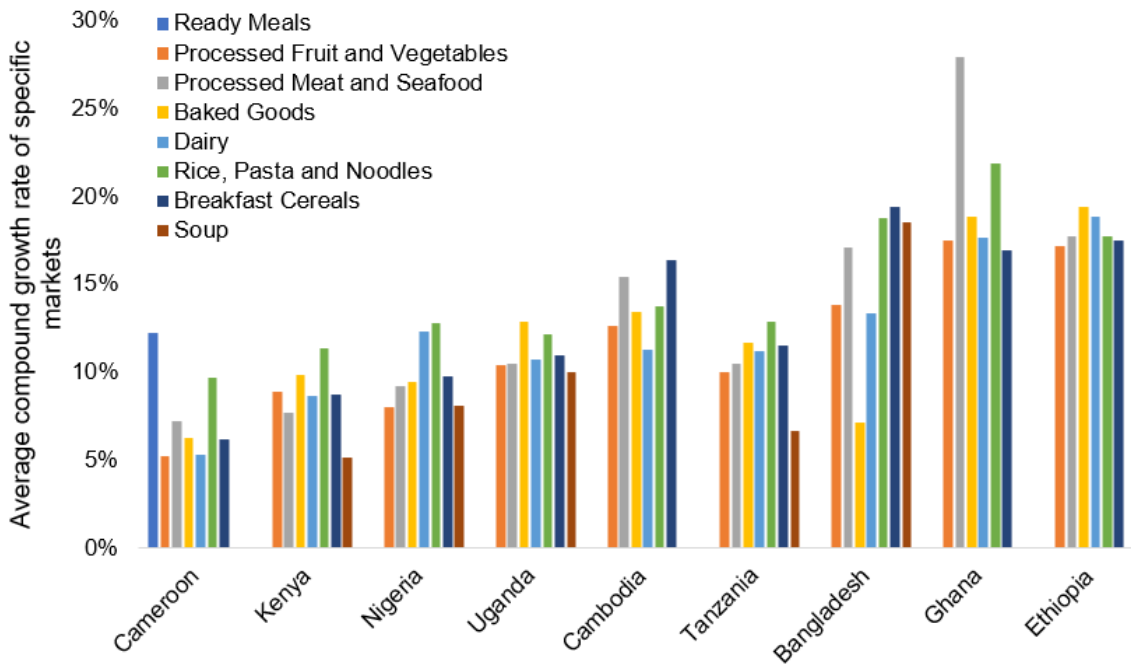


Figure 28 Average annual growth rate of packaged foods of interest (2005-2020) - MECS countries

Figure 29 and Figure 30 display the retail value and normalised growth of some packaged food sub-sectors of interest in select countries in Sub-Saharan Africa (SSA). Data exists only for Angola, Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Nigeria, South Africa and Uganda. Hence, these trends cannot be said to be representative of SSA as a whole. Dairy has the highest magnitude of any sector in retail value, followed by baked goods and then Rice, Pasta and Noodles. The smallest sectors, in ascending order, are Soup, Ready Meals and Processed Fruit and Vegetables. Ready Meals show the fastest rate of growth followed by Soup. Processed Meat and Seafood has the most variable growth pattern with two periods of decline (2006-2008 and 2017-2018).



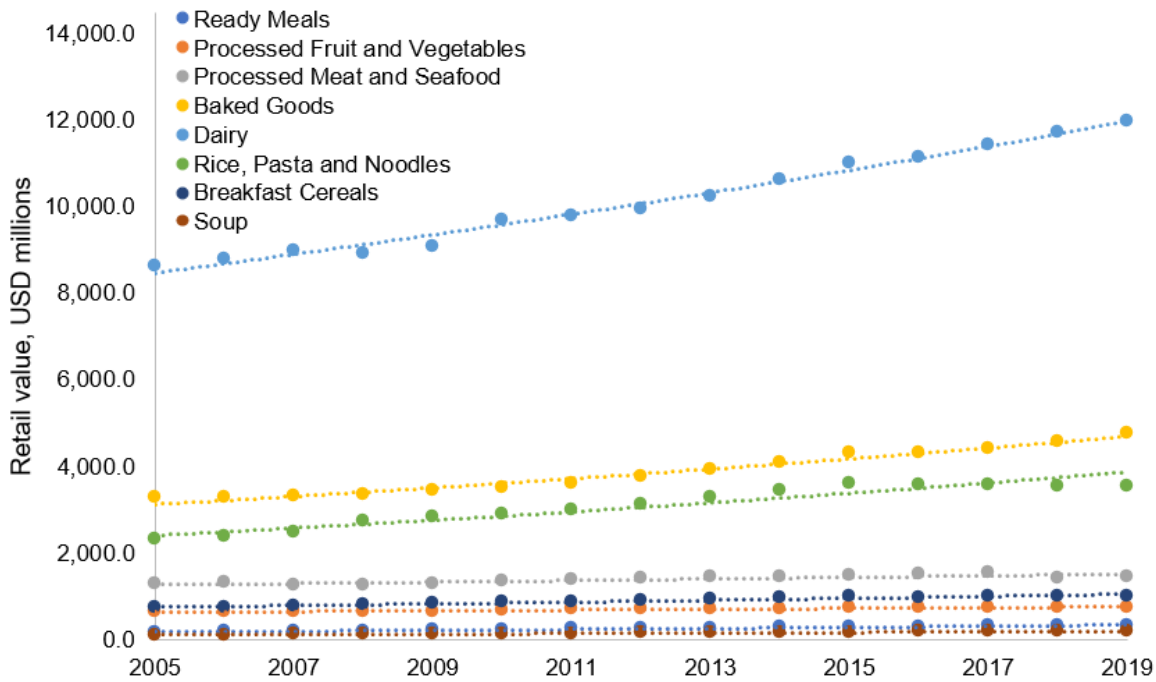


Figure 29 Growth in packaged foods of interest – Sub-Saharan Africa

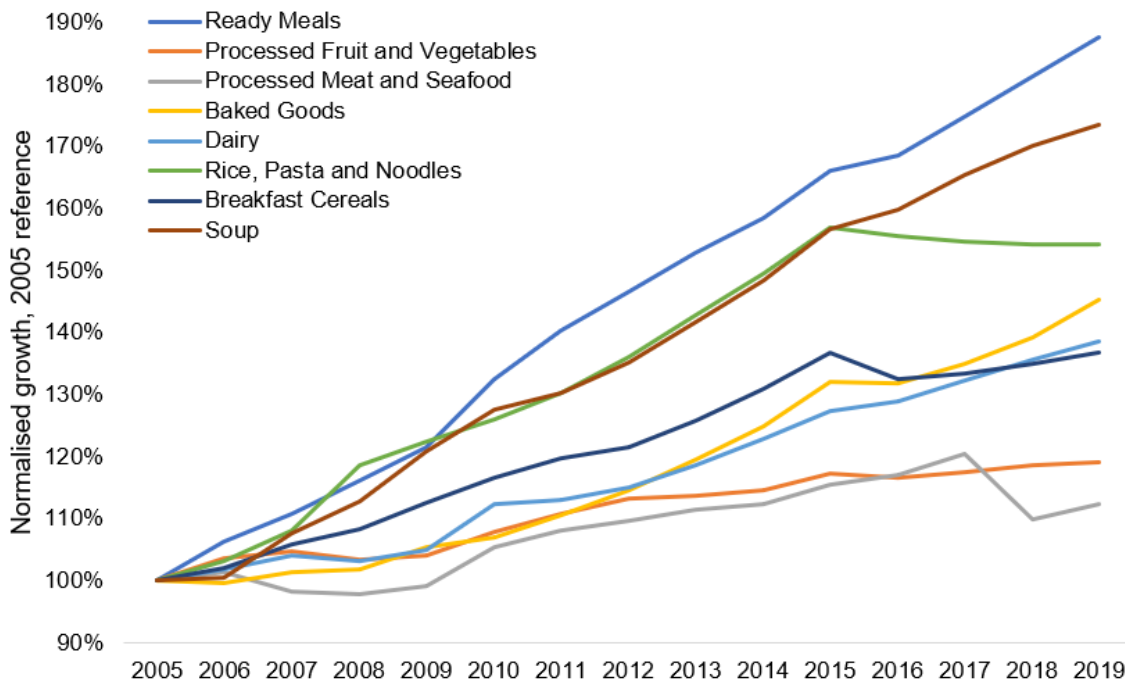


Figure 30 Growth in packaged foods of interest – Sub-Saharan Africa (normalised)

Figure 31 and Figure 32 describe the same measurements for Asian countries. These include: Bangladesh, Cambodia, India, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka and Thailand. Again, dairy also holds the highest retail value with respect to the other sectors observed. In 2019, the aggregated retail value of the dairy market in these Asian countries was more than three times the magnitude of the market in the nine SSA countries in Figure 29. The smallest markets in ascending order are: Soup, Processed Fruit and

Vegetables, Breakfast Cereals and Ready Meals. Processed Meat and Seafood is the only sector which displays a period of decline in growth greater than 1% between 2017 and 2018. The fastest growing sector are Ready Meals and Breakfast Cereals, closely followed by Rice, Pasta and Noodles.

A difference between these two groups is the order of prominence in retail value. Rice, Pasta and Noodles are higher in retail value than Baked Goods in Asia (see Figure 31), but not in Africa (see Figure 29). In SSA, the growth of Rice, Pasta and Noodles plateaus from 2015 onwards (see Figure 30). In contrast, Asian growth of Rice, Pasta and Noodles sustains. Another area of difference is the magnitude of normalised growth. Where SSA's peak growth in Ready Meals is 188% in 2019, Asia's peak growth in Ready meals is more than 1.5 times greater at 287% for the same year. Asia's growth of Breakfast Cereal is greater than SSA's being the second fastest growing food group. The normalised growth of Soup is very similar in these two areas, however, overall, the Asian market displays higher growth rates than the SSA market.

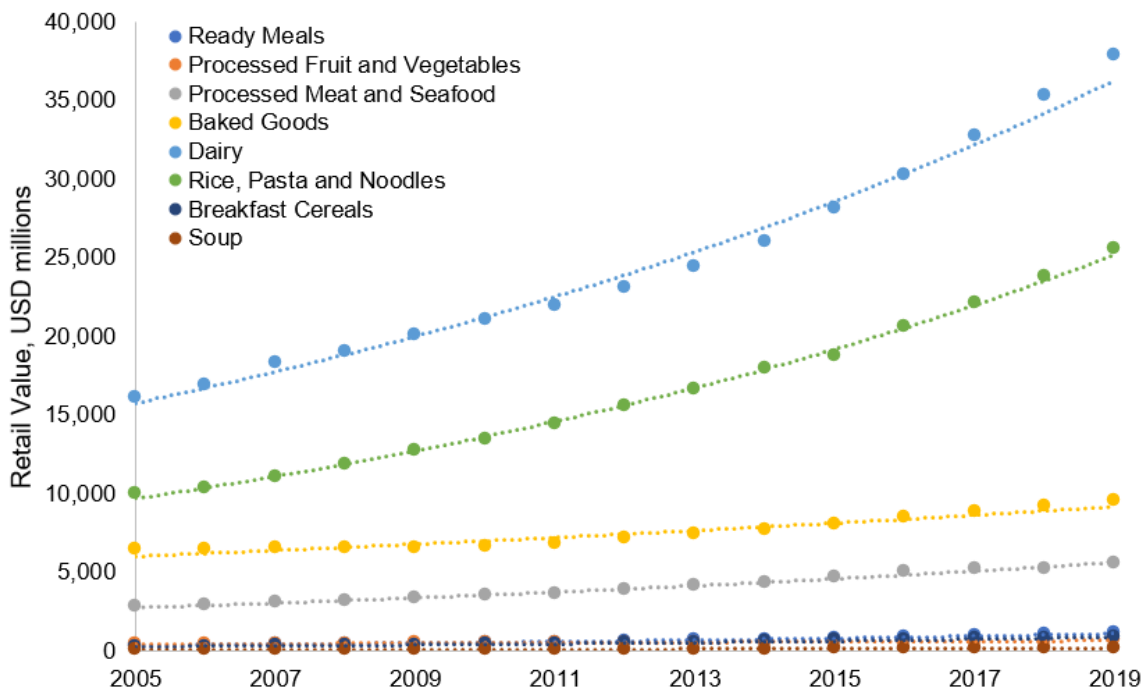


Figure 31 Growth in packaged foods of interest – South and South-East Asia

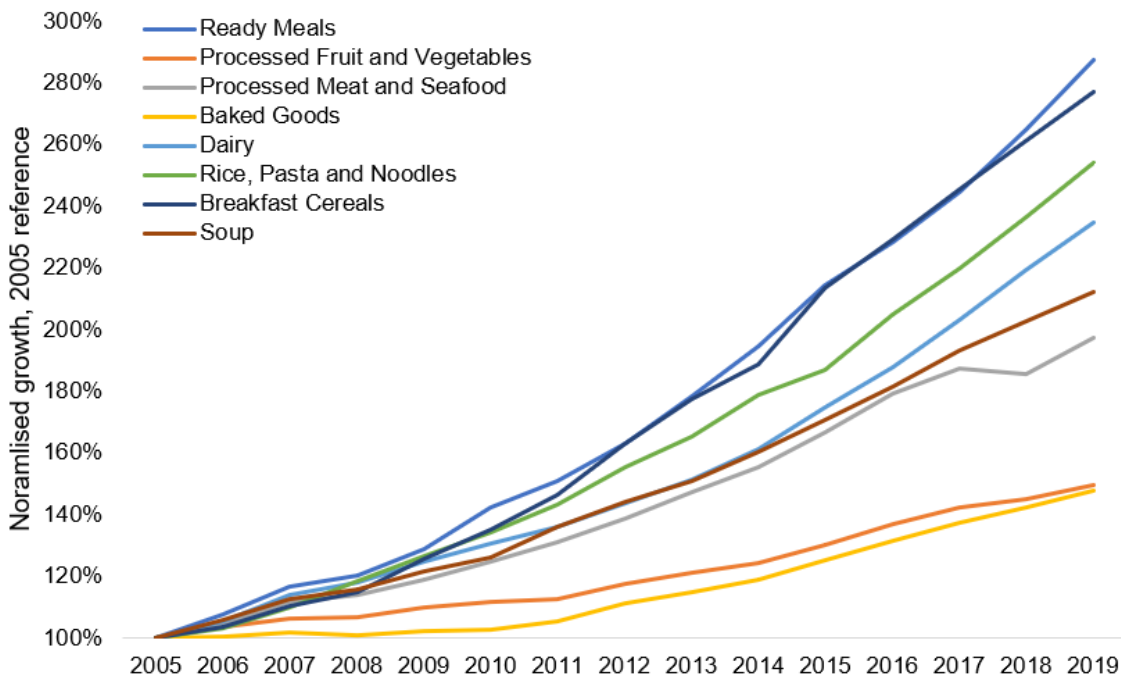


Figure 32 Growth in packaged foods of interest – South and South-East Asia (normalised)

Figure 33 demonstrates some of the magnitudes of different national packaged food markets of MECS countries²¹ and how they have developed over time. In 2005, the most valuable market observed was Kenya and the lowest value market was Ethiopia. Each country experienced a different rate of average annual compound growth as evident in Figure 27. By 2019, Bangladesh’s market value of Packaged Food overtook Kenya, and Ethiopia’s market value overtook both Cambodia and Cameroon.

²¹ These five countries were chosen to show a comparison between fast and slow growing markets from both SSA and SSEA

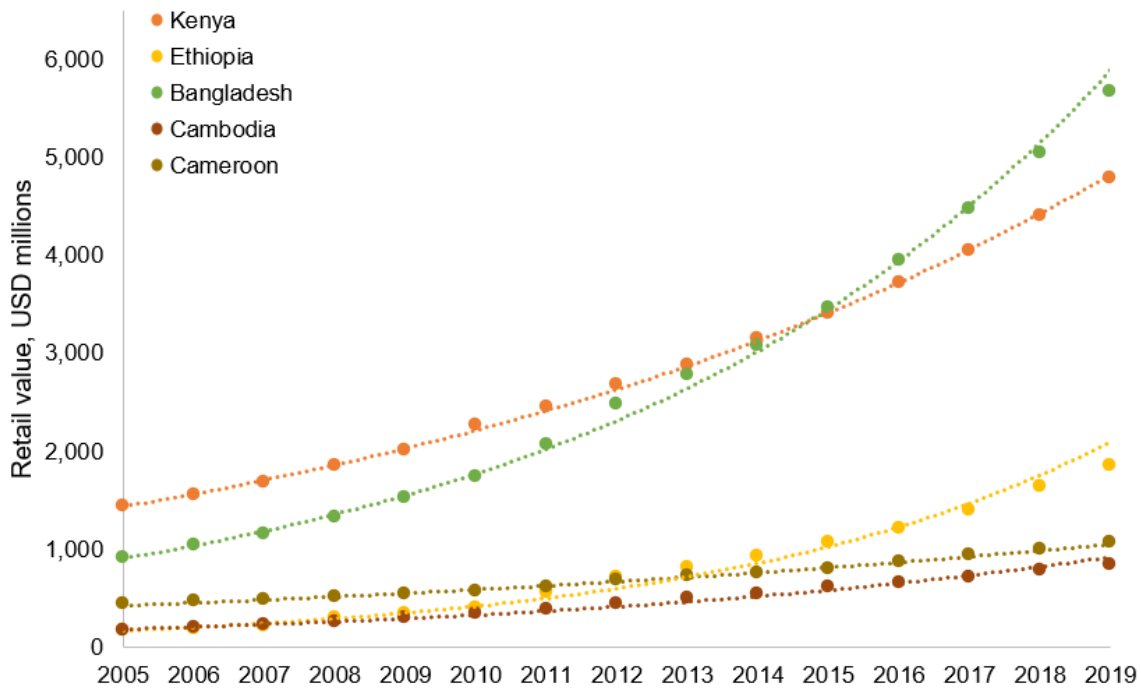


Figure 33 Packaged food retail value for different MECS countries

What is evident in Figure 34 is the growth in value of certain Packaged Food markets in Bangladesh. What is of note is the lag in retail value of Rice, Pasta and Noodles for Bangladesh when compared to the rest of the Asian countries. Figure 31 shows that, for the Asian countries observed, Rice, Pasta and Noodles is the second highest market, above Baked Goods in every year. In Bangladesh alone, that trend is only evident from 2018 onwards. For comparison, Figure 35 shows the same chart for Uganda, the country’s market composition follows its fellow SSA countries (evident in Figure 29). Until 2011, Bangladesh had an arrangement of sectors more similar to SSA countries than its fellow Asian countries; after 2011, the retail value of Rice, Pasta and Noodles accelerated. Packaged rice is the largest contributor to Bangladesh’s Rice, Pasta and Noodles sector. Although, interest in pasta and noodles is also growing due to the perception of being ‘exotic’ and their convenience, Euromonitor explain the trend in packaged rice growth as follows (Passport Euromonitor, 2014):

“sales of packaged rice are set to continue increasing as a growing number of people shift away from unpackaged rice due to urbanisation, rising incomes, the development of formal retailing and the wider understanding of potential issues surrounding hygiene and supply chain integrity.”

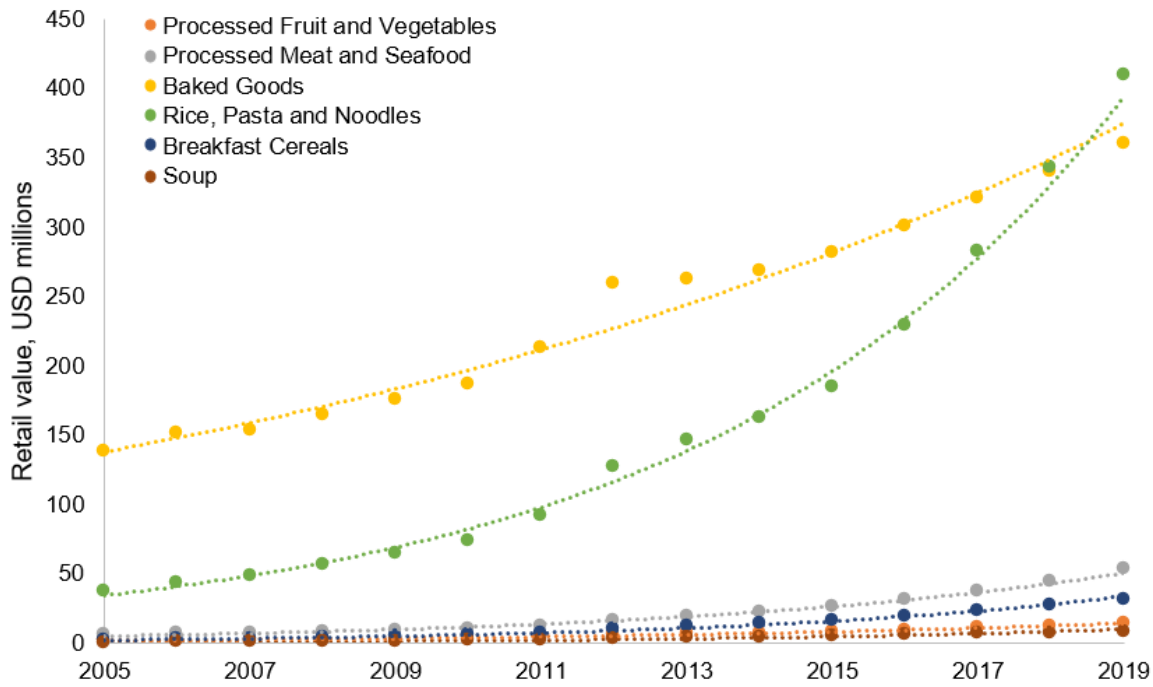


Figure 34 Sector specific retail value for Bangladesh

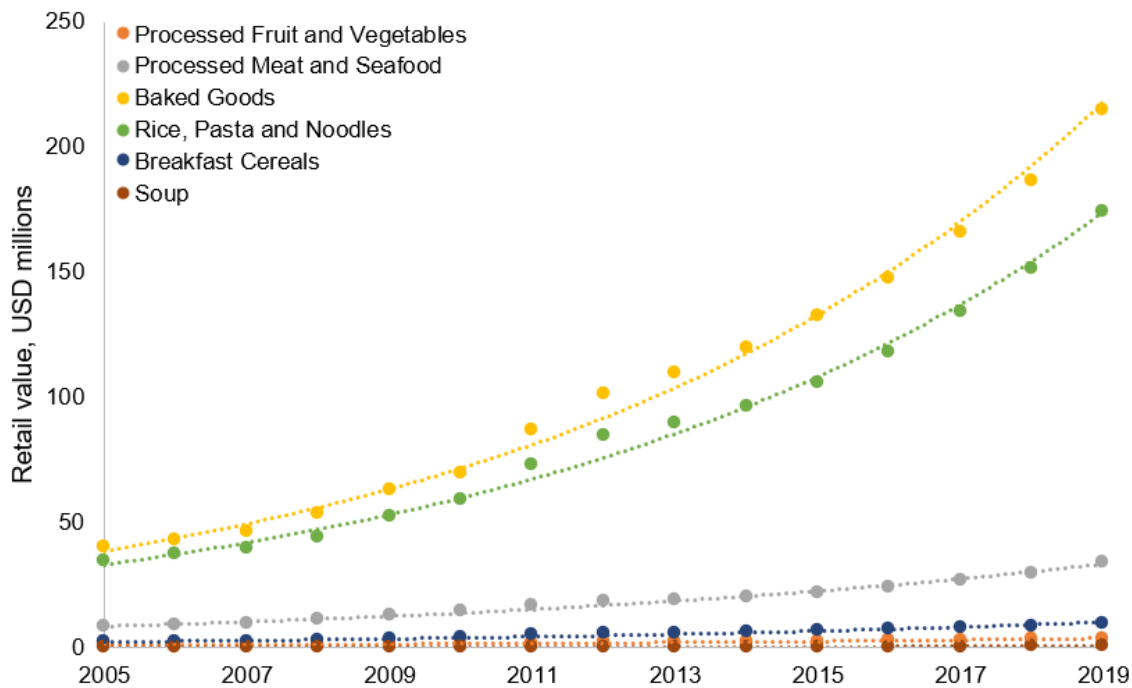


Figure 35 Sector specific retail value for Uganda

5.5 Processing of Beans

Beans represent an important crop for low and middle-income countries. Their contribution to protein intake in SSA is among the highest in the world (IDRC, 2017), (Aseete et al., 2018). In Rwanda, beans are the primary protein source for 90% of households (Mukamugema et al., 2019). With a high protein density and lower cost than meat products, it is unsurprising that beans have earned the title of a ‘poor man’s meat’ (Mfikwa & Kilma, 2014), (Ugen et al., 2017). As well as costing less than meat, beans do not exacerbate global warming to the same degree. Beans rank below other protein sources, such as beef, shrimp, pork, poultry and eggs, in global warming potential per weight (Berardy et al., 2019). The high nutritional value of beans contributes to good health, especially in women of reproductive age and children (Schoeninger et al., 2017), (Ugen et al., 2017). Between 1994 and 2008, bean consumption rose by 1.67% per capita per year in SSA. A study of Ugandan households suggested that the average annual consumption per person was 22.41kg of beans with 98.4% of households reporting frequent consumption (Aseete et al., 2018).

5.5.1 Limiting Factors to Bean Consumption

Widespread consumption of beans has slowed, and even decreased in some areas (Schoeninger et al., 2017) due to a few major constraints. In SSA, beans are predominately consumed as a dry grain ((Aseete et al., 2018), (Ugen et al., 2017). Drying beans is an effective processing technique for lasting nutrition, however, this process increases the required cooking time significantly (Aseete et al., 2018). Dried beans that have not been pre-cooked or pre-soaked require 120-180 mins to cook (Aseete et al., 2018), (Ugen et al., 2017), (Mukamugema et al., 2019). With the use of a catalyst or pre-soaking, this time can be reduced to 58-107 mins, however, in Uganda, these techniques are not used (Aseete et al., 2018). The time requirement depends on bean variety, cooking method, quantity cooked and the length of time in storage (Aseete et al., 2018). The latter of which may be attributed to ‘the hard-to-cook phenomenon’, where poor storage facilities with a high temperature and humidity increase the required cooking time, decrease nutritional value and reduce palatability (Reyes-Moreno, 1993). Additionally, poor quality or absence of storage contributes to the 30% post-harvest loss of beans in Kenya (Ugen et al., 2017). Chilled or frozen beans require refrigerated storage which is a major constraint to many consumers (IDRC, 2017), (Aseete et al., 2018), (Ugen et al., 2017).

The lengthy cooking time required for dried beans acts as an effective multiplier on other major constraints such as energy, water and fuel usage. Significant savings of resources and money for the consumer are possible if the time requirement can be reduced. Breeders have introduced new fast-cooking bean varieties, yet demand for further reduction in cooking time is evident (Aseete et al., 2018).

Energy for cooking is commonly fulfilled by the combustion of wood or charcoal, and in Uganda this was the case for 87.9% of rural households and 79.1% of urban households (Aseete et al., 2018). Sourcing this fuel, at the required quantities, makes dried bean cooking an indirect contributor to deforestation and climate change as well as having a negative impact on health (Mukamugema et al., 2019). To avoid boiling dry, dried beans require a relatively large volume of water which may be paid for by consumers or carried long distances (Aseete et al., 2018). Notably, in Uganda, limited cooking fuel availability has increased the price of fuel to where dry bean consumption is neither convenient or affordable (IDRC, 2017), (Ugen et al., 2017). In Tanzania, other promising legumes such as pigeon peas are seldom consumed due to a lack of knowledge on how to cook them (Wangari et al., 2020). This leads to only 35% of pigeon pea production being domestically consumed in Tanzania and a mere 10% in Malawi for similar reasons (Simtowe et al., 2016). When asked, Tanzanian chefs trained in cooking pigeon peas felt this legume cooked faster and used less fuel when compared to some types of beans (Wangari et al., 2020). Finally, knowledge of the pulse market is not often obtainable for entrepreneurs in the sector. This limits their ability to form effective marketing strategies (Mfikwa & Kilma, 2014).

5.5.2 The Pre-Cooked Bean

To encourage bean production and consumption, a pre-cooked processed bean product offers a solution to the aforementioned constraints. The process of pre-cooking beans entails cooking dried beans at high pressure and temperature which is cost-effective, maintains the bean's integrity and improves nutritional value of the final product (Ugen et al., 2017), (Aseete et al., 2018). They are cooked with electricity, in bulk, in energy efficient factories (Mukamugema et al., 2019). Hence, pre-cooked bean adoption; reduces demand on wood based fuels, requires less overall energy and enables future developments to decarbonise the process by supplying electricity from renewable sources. The resulting product requires 10-15 mins to cook at home (IDRC, 2017), (Ugen et al., 2017), (Mukamugema et al., 2019). This 105-170 min reduction in domestic cooking time results in a fuel saving of over 80% for consumers along with reduced water use (Ugen et al., 2017). As explained by Aseete et al.:

“The cooking time for the pre-cooked bean is about 10–15 min which lowers the fuel and water quantities required for cooking. Shorter cooking time also means that the time spent in the kitchen cooking reduces – increasing convenience for persons who cook the beans.” (Aseete et al., 2018)

A selection of processors, of all sizes, are involved in producing pre-cooked bean products across SSA. This has been pushed by demand for the convenience of this food stuff (Nakazi et al., 2019). The preferred outlets for the processed pre-cooked bean product are supermarkets, kiosks and 'mom and pop' stores (Ugen et al., 2017). Evidence in Uganda suggests that rural households fulfil 74.2% of their bean consumption with their own produce. This compares with 9.7% in urban consumers (Aseete et al., 2018). It is posited that urban consumers' greater reliance on the market will increase the demand for pre-cooked beans in built-up areas. When asked to assess their own willingness to adopt pre-cooked beans, consumers in Uganda stated they would, on average, consume 24.9 kg per capita per year (Ugen et al., 2017) – up by 2.49 kg per capita per year from dried beans (an 11.1% increase) (Aseete et al., 2018).

5.5.3 Constraints to the Pre-Cooked Bean

Despite pre-cooked beans' acceptance of 89.1% (IDRC, 2017), its prevalence is limited. The IDRC pre-cooked bean project stated a limited supply of beans as its main barrier to progression (Cultivate Africa's Future, 2018). In Kenya, most of the bean suppliers to an observed factory (79%) were domestic, yet more than half (52%) of the actual beans supplied for processing had to be imported due to poor quality of locally grown beans (Ugen et al., 2017).

It has been noted that major impact can be made quickly by introducing new and beneficial food stuffs to institutions like schools, hospitals, prisons and military canteens (Wangari et al., 2020). Mukamugema et al. studied pre-cooked bean adoption, or lack thereof, in schools and hospitals in Rwanda (Mukamugema et al., 2019). Of the surveyed respondents who did not adopt pre-cooked beans, 50% stated lack of sufficient information about the food stuff as the primary constraint. The unavailability of pre-cooked beans was stated by 33.9% to be a barrier to their adoption. Perceived high price was expressed by 29% of respondents. Sustainability of the pre-cooked bean industry was additionally declared, as explained by the authors:

“16.1% of respondents that have not adopted pre-cooked beans indicated their distrust in the sustainability of the pre-cooked beans industry as one of major barriers to adoption. Those respondents claimed that since the first company producing pre-cooked beans has closed down, there is nothing to guarantee that this new company will not also close soon after they have started cooking their beans.”

Another 9.6% expressed a perception that packaged foods are less nutritious and hence did not adopt the pre-cooked bean product.

The upfront cost of a typical pre-cooked bean product is triple that of dry beans per weight, pushing the product out of reach of most consumers. This low market share, combined with a lack of information on marketing practices (Nakazi et al., 2019), has dissuaded private investment into the sector, which requires large capital investment (Aseete et al., 2018), (Ugen et al., 2017). A public-private arrangement is used in IDRC’s pre-cooked bean project (Cultivate Africa’s Future, 2018). In Kenya, where the sector is relatively established, a duopoly exists where two leading bean processing firms control over 70% of the market (Ugen et al., 2017).

Although the upfront cost of pre-cooked beans is three times greater than dried beans (Aseete et al., 2018), (Ugen et al., 2017), the real cost difference is lower. This is due to the savings that exist in fuel, water and time. A saving of USD 0.505 per kg of beans prepared is evident in the fuel costs alone (IDRC, 2017). As fuel prices rise in urban Uganda, this saving will become increasingly important (Aseete et al., 2018). The willingness to pay (WTP) is altered for pre-cooked beans when compared to dried beans. Consumers’ WTP in Kenya and Uganda increased by 31% per kg of pre-cooked bean product. If nutritionally enhanced and the savings in time, water and fuel are made evident, the WTP could reach as high as 41% (Ugen et al., 2017). The pre-cooked bean industry also has the ability to create employment and hence income for smallholder farmers, most of whom are women (Aseete et al., 2018).

5.5.4 Pre-Cooked Bean Packaging Assessment

Traditionally, pre-cooked beans are packaged in cans. This system is recyclable, hermetic and durable. However, the IDRC’s pre-cooked bean project favours polymer packaging such as PET, where a shelf life of 12 months has been achieved (Ugen et al., 2017). Private companies such as FarmFresh, in Rwanda, are also forgoing canning technologies, opting instead for retort pouches²².



Figure 36 Pre-cooked beans launched in Kenya ©2017CIAT/GeorginaSmith

²² <https://www.farmfresh.rw/>

Packaging is the major contributor to the increased price of pre-cooked beans. Taiwo et al. compared packaging a baked bean product in cans and retort pouches for a Nigerian market (Taiwo et al., 1997). The pouch was found to account for 60.2% of the final products' cost and the can accounted for 75.8% for the same volume of product. Savings also exist in processing when opting for the retort pouch. The authors stated that the energy requirements for the pouch system was lower than the canning system. This was attributed to the pouch's slim geometry, aiding rapid heat transfer. Processing time was, thus, reduced by 30-40% (when compared to canning systems) and overcooking of the surface was minimised, which may increase the nutrients of packaged pre-cooked beans in a retort pouch as opposed to a can. However, the authors point out that at the time of writing, the energy costs of a processing plant were minute and accounted for approximately 1% of the total operational costs. Transportation energy is additionally reduced as the pouch system weighs less than the can.

Although lower energy demand of retort pouches was assumed by Taiwo et al., life cycle assessment, comparing cans and retort pouches, agrees. Retort pouches, in the context of packaging tuna in Ecuador, was found to demand 95.1 MJ per kg of packaging produced compared to the canning requirement of 151.9 MJ per kg of packaging. The equivalent kg CO₂ emitted was more than double for canning (Avadí et al., 2015), however, final disposal was not taken into account. Where a 'cradle to grave' assessment of the two systems has been undertaken, literature disagrees with the claim that equivalent kg CO₂ production is more for tin cans (Hurley et al., 2013), reasoning that the recyclability of cans acts as a carbon credit, offsetting some of the initial carbon emitted in can production. In the study, retort pouch's equivalent kg CO₂ was found to be slightly higher than tin cans. However, in the production stage, both literatures agree that retort pouches are more environmentally profitable.

The main limit to retort pouch's prevalence is the fixed capital investment required to set up the factory. Canning lines require far less capital to get operational and, where demand for pre-cooked beans is not explicitly clear, this is disincentive to pioneer retort pouch packaging (Taiwo et al., 1997).

5.6 Consumption and processing of Sorghum and Millet

Globally, sorghum is the fifth most important cereal (Awika & Rooney, 2004). In 2013, millet production ranked sixth most produced in the world (FAOSTAT, 2013, Commodity Balances - Crops Primary Equivalent). The value chains of the 'big three' cereals of maize, wheat and rice have received heavy investment, whereas the chains of sorghums and millets are relatively underdeveloped (Anitha, Govindaraj, et al., 2020). Despite being overlooked in the past, the promise of sorghums and millets are being highlighted by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Both cereals boast a high nutritional value (Schipmann-Schwarze et al., 2015), each contributing to good health in a myriad of ways. Millets have been shown to help prevent and cure health issues such as obesity, cardiovascular disease and diabetes (Durairaj et al., 2019). Where bio-fortification has been used to increase the iron count, pearl millet has been shown to reduce anaemia (Finkelstein et al., 2015). Where the effects of including millet meals in school menus have been observed, the extent of undernutrition has diminished, improving children's height, weight and haemoglobin levels beyond that of regular fortified rice meals (Durairaj et al., 2019), (Anitha et al., 2019). Sorghums demonstrate higher antioxidant activities than some of the highest antioxidant rich fruits such as blueberries. When consumed regularly, sorghums have anti-carcinogenic properties that are either not evident or lacking in wheat and corn. Like millets, sorghums display an improved cardiovascular health in animals (Awika & Rooney, 2004).

The 'big three' cereals of maize, wheat and rice cannot supply the consumer with a complete protein source. When these cereals are combined with protein dense legumes, such as beans, the meal still lacks essential amino acids such as methionine and cysteine (Anitha, Govindaraj, et al., 2020). Millets, however, are naturally high in these amino acids (Anitha et al., 2019) and as such, complement bean consumption perfectly (Anitha, Htut, et

al., 2020). Sorghums have also been paired with legumes to create a protein source, where the mix of sorghum to pigeon pea to soybean was found to maximise protein at a ratio of 71.4:14.4:14.3 (Adeola et al., 2017).



Figure 37 A High-iron pearl millet farmer with part of her harvest India CC ICRISAT 2007

Both millets and sorghums are classed as C4 cereals. (Kumar et al., 2018), (Taylor and Belton, 2002). This classification means the crop is carbon negative and water efficient and, hence, environmentally sustainable (Kumar et al., 2018). It is claimed that sorghums and millets require three times less water than wheat and 10 times less water than rice to grow (Kane-Potaka, 2018). For millets, this is in part attributed to their short maturity time of 60-90 days (Kumar et al., 2018). In semi-arid areas where cultivation of maize is considered risky (Schipmann-Schwarze et al., 2015), sorghums and millets can yield an economical crop, even on acidic soil (Awika & Rooney, 2004), (Kumar et al., 2018).

It is for these reasons that ICRISAT has labelled sorghums and millets ‘Smart Foods’ – food that is good for you, good for the planet, and good for the farmers. The Smart Food campaign focuses on the promotion of alternate staple foods, of which sorghums and millets are the key crops. ICRISAT are pushing for development around these crops to reduce agriculture’s impact on the environment, benefit smallholder farmers and alleviate public hunger and poverty²³.

²³ <https://www.icrisat.org/smartfood/>

5.6.1 Constraints to the Consumption of Sorghum and Millet

In the face of malnutrition in the countries that produce sorghum and millet, most of the produce from these cereals is destined as fodder for animals (Awika & Rooney, 2004), (Anitha, Govindaraj, et al., 2020), (Anitha, Htut, et al., 2020). In Myanmar, rice displaces millet almost exclusively as the main staple (Anitha, Htut, et al., 2020). In Tanzania, negative perceptions of finger millet were present in school students and stakeholders alike (Wangari et al., 2020). In Uganda, a similar notion was echoed with the idea that finger millet was a ‘poor man’s crop’ (Schipmann-Schwarze et al., 2015). For many, a paucity of knowledge hinders the uptake of these two cereals. Studies in Myanmar, Tanzania and India have all outlined a gap in the knowledge of how to cook millets and sorghums domestically (Anitha, Htut, et al., 2020), (Wangari et al., 2020), (Anitha et al., 2019).

For institutions where millet meals are trialled, the cost of the millet meal is often too high to sustain. Anitha et al. studied a school in India where rice-based school meals were commonplace (Anitha et al., 2019). When little millet, pearl millet and finger millet were trialled, the associated meal costs were found to be 50%, 37% and 21% higher than the rice-based meal, respectively. The authors point out that if the cheaper rice meal was supplemented to have the same nutritional benefit as the millet based meal, the cost would be equal. In Tanzania, the high cost of a finger millet base meal was attributed to the low availability of the crop, limiting the availability of the large quantities required by the school (Wangari et al., 2020).

Additionally, if poorly processed or cooked, millets can contain anti-nutrients which inhibit nutrient absorption such as phytic acid (Anitha et al., 2019).

5.6.2 The Processing of Sorghum and Millet

Harvesting of sorghum and millet can often be performed by ill-suited equipment. For example, the dehulling of small millet is usually carried out with an abrasive roller. This leads to a loss in nutrition as nutrient dense parts of the yield are lost. Durairaj et al. suggest a centrifugal dehuller which maintains maximum nutrients and is more efficient at kernel recovery (Durairaj et al., 2019). Correct harvest processing of sorghum seed is essential as this reduces the level of tannin in the final product (Adeola et al., 2017). Tannins contribute to reduced protein digestibility (Moneim et al. 2007).

Processing via boiling and pressure cooking result in a reduction in tannins (Kumar et al., 2018). For pearl millet, this takes two hours of soaking time and 15 minutes cooking time (Anitha, Govindaraj, et al., 2020). Cooking additionally, reduces anti-nutrients and promotes nutrient availability (Kumar et al., 2018), (Anitha et al., 2019).

However, it is flour that is the most important value-added product derived from these crops (Schipmann-Schwarze et al., 2015). From the processed flours of sorghum and millet, roti, cookies, expanded snacks, biscuits, bread, pasta and breakfast cereals etc. can be made – using the flour as either a nutrient dense fortification or a complete replacement (Anitha, Govindaraj, et al., 2020), (Awika & Rooney, 2004), (Kumar et al., 2018). The use of foxtail millet flour can replace up to 50% of wheat flour in bread without affecting the acceptability. It’s addition slightly increases the total protein and mineral content of the final product (Kumar et al., 2018). Rai et al. studied different flour combinations in the development of a gluten-free cookie product (Rai et al., 2014). A blend of sorghum and millet flours was found to have the highest score for sensory evaluation when compared to combinations of sorghum, millet, maize and rice flour. The final cookie developed with sorghum and millet flour was calorie and protein dense with higher fat than the other cookies.

To many processors, sorghum and millet processing supplements their main business. As evidenced by Schipmann-Schwarze et al. in Tanzania (Schipmann-Schwarze et al., 2015). The authors describe how urbanisation has created a high demand for traditional cereals from a health-conscious audience. In Kenya, their research showed that 69% of interviewed processors reported increased demand in finger millet flour and 64%

reported increased demand in sorghum flour. In Uganda, 100% of the processors reported increased demand for both products and 95% reported increased demand in Tanzania. This finding is coherent with Figure 27 where Kenya has the lowest average compound growth rate out of these three countries and Tanzania and Uganda display similar rates of growth. In all three countries, it was shown that most raw material was supplied to processors by traders, not farmers. Newly-opened processing facilities that specialised in sorghum and millet flours were usually found to be self-help groups for women's associations.

5.6.3 Barriers to Processors of Sorghum and Millet

Schipmann-Schwarze et al. provide great detail on constraining factors for processors of millet and sorghum flour in Tanzania, Kenya and Uganda (Schipmann-Schwarze et al., 2015). In Tanzania and Uganda, more so than in Kenya, processors were hampered by poor access to modern energy. Power cuts were stated as constraints by over half the Tanzanian processors and over a third of the Ugandan processors. Most processors did not have backup generators due to the associated running and capital cost. Energy costs constrained more of the processors in Uganda than Tanzania or Kenya. Lack of appropriate machinery also hindered growth with many processors unaware of where to buy good machinery. The capital required to invest in machinery was often too large to undertake and access to credit was dismal. Poor quality of grain constrained the processing sector. Millet quality was stated as more unreliable than sorghum by both Kenyan and Tanzanian processors. In Uganda, 21% of processors stated that poor quality millet grain contributed to high losses. Lack of access to credit, and or lack of knowledge on where to apply for credit, also affected supply in every country studied. The authors observed that processors did not have enough capital to buy large quantities of grain at harvest time when prices are lowest. The seasonal fluctuation in availability of sorghum and millet constrained procurement. Supermarkets, which acted as the primary outlet to processors in all countries, used a fixed price contract – where processors could not change the price of their product according to raw material availability. Procurement in Kenya was also hindered by trade bans with Tanzania.

Processors, in all of the countries studied, outlined a lack of knowledge in consumers as a constraint to their business. In Uganda, sorghum flour was considerably less important than millet and its processing was not undertaken formally. Consumers and institutions alike were unaware of the crops and preferred cheaper products. Analogous to pre-cooked bean adoption in Rwanda, sorghum and millet flour was seldom sold to hospitals and schools in Kenya and Tanzania. The markets for these flours were not as developed as other cereals which have received government investment. The authors point out the interrelationality of the situation:

“If sorghum and finger millet were more popular, they might receive more government support, while support might make the two crops more popular. Lessons learned from the maize sector pointed in the same direction. Seventy-one percent of processors [in Tanzania] attributed success with maize to a functioning market infrastructure, followed by crop promotion (50%).”

As a possible means of effective communication, door-to-door sales are often too expensive and time consuming for private enterprises. ICRISAT has supported a novel way of increasing awareness of these ‘Smart foods’ through reality TV in Kenya. Supported by US AID in its first year, the TV show became self-sufficient through sponsorship (Kane-Potaka, 2018). The TV show is a cooking competition which places ‘Smart foods’, such as millet and sorghum, at the centre of attention²⁴.

Processed flours should be packaged with a moisture content below 15% to ensure a stable shelf life (Adeola et al., 2017). Schipmann-Schwarze et al. state that high quality, expensive and attractive packaging was expected by supermarkets and consumers alike (Schipmann-Schwarze et al., 2015). To consumers, the packaging was as

²⁴ <https://foodtank.com/news/2018/05/reality-tv-bringing-back-smart-food-icrisat/>

important as the flour quality. In Tanzania, the availability of high-quality packaging was low and much had to be imported, at a premium, from Kenya. This placed the cost of the final packaged flour above where most consumers could afford. In Uganda, the unavailability and expense of packaging was stated as a challenge by 21% of processors interviewed.

6 Eating out

In this section, we cover the state of eating out from two scales, examining trends in the foodservice industry and considering evidence for consumer eating out habits. We then discuss the emerging trend of online food delivery services, which is becoming more prominent globally and beginning to integrate into MECS focused countries. Finally, we examine the evidence for drivers and barriers to eating out.

6.1 Industry Level: The Foodservice industry

Figure 38, Figure 39, and Figure 40 show the value of the industry segmented by the Euromonitor definitions discussed in Section 3.1, for India and Nigeria respectively (Passport Euromonitor, 2019a, 2019b). Nigeria was the only MECS-focused country for which this data existed, and India is extracted as a lower-middle income country that could shed insight into the situation in South Asia. The box below picks out facts of interest about the industry for India and South Africa found on Statista (Huhn, 2020; Jaganmohan, 2020; Statista Research Department, 2016, 2018). Despite the lack of data for more MECS-focused countries, it is still useful to consider the state and trends of eating out industries in India, South Africa, and Nigeria, because there is a potential for these countries to be trend-setters for the rest of their regions (South and South-East Asia and Sub-Saharan Africa). Other MECS-focused countries might be expected to tread similar paths at some point. Of course, it is acknowledged that the particular contexts of MECS focused countries, and their relatively lower incomes compared to the following countries, will play a large role in their own eating out trends.

According to Euromonitor, the foodservice industry in India is dominated by street stalls/kiosks, which is continuing to grow at a steady rate. In Statista, the Indian foodservice industry is split by 'organized' and 'unorganized', where 'unorganized' refers to 'individuals or families selling ready to eat food through vendors, dhabas²⁵, food carts, street stall and more'. This will contain much of the street food industry and is growing by 6% per year (as a comparator, consider the population in India is growing at a rate of 1% per year) (World Bank Data: Population Growth (Annual %) - India, n.d.).

²⁵ A dhaba is a restaurant found on the side of major roads in India, commonly frequented by truck drivers (Wikipedia)

FACT BOX: STATISTICS ON EATING OUT FROM STATISTA

Restaurants & Fast Food

India: Quick service (fast food) restaurants have 45% market share of the food & beverage service industry (out of fine dining, casual dining, quick service restaurants, cafes, others). (2017)

India: 53% of the population eat fast food more than 1-3 times a week (2018)

South Africa: Restaurants, bars and canteens revenue forecasted to grow 28% from 2017 (5.3b USD) to 2023 (6.7b USD)

Unorganized segment of foodservice

India: Market value of 'unorganised' segment of the restaurants and food service industry is 61% of the total (33.5b USD) (2019)

India: Growth rate of unorganized segment is 6% per year (urban population growth is 2.3% per year)

Behaviour

India: 15% eating out in India is due to shopping and casual dining; 39% are friend or family related events; just 8% are an alternative to cooking. (2018)

Although currently small in value relative to street food/kiosks, noticeable also is the rapid growth in limited-service restaurants (fast food) in India shown in Figure 38. An alternative way of cutting the data from Statista suggests that Quick service restaurants have the largest market share out of fine dining, casual dining, and cafes (note this does not include street food). This, coupled with the information that just over half of Indians eat fast food more than once a week, shows that fast food is a rising trend.

On a regional level, in South-East Asia, large differences extend across the region in terms of the penetration of fast-food outlets. Somewhat dated data from 2008 showed that there were over 100 McDonalds restaurants in the wealthier countries (Thailand, Malaysia, Singapore, the Philippines), and none in Myanmar, Cambodia, Laos, Vietnam (Van Esterik, 2008). Fast food is not nearly as prolific or popular as local food served from streets or small restaurants as it cannot compete with the popularity of local dishes.

Figure 39, for Nigeria, shows a quite different situation. Cafes and limited-service restaurants have the highest value in the foodservice industry of approximately 6 billion USD while street food is just over half this, at 3.5 billion USD. Nonetheless, in all sectors an upwards trend is evident. In terms of number of outlets (Figure 40) there are near equal numbers of limited-service restaurants and street stalls/kiosks, and the industry is dominated by single or small chains of outlets. The international fast food brands make up just 0.4% of the limited service restaurants in operation. In African countries, such as Nigeria, where international and more local fast food outlets serving 'westernized' fast food have gained a hold in the market, they serve adaptations of the local cuisine in order to attract customers who prefer traditional foods (Friend, 2014).

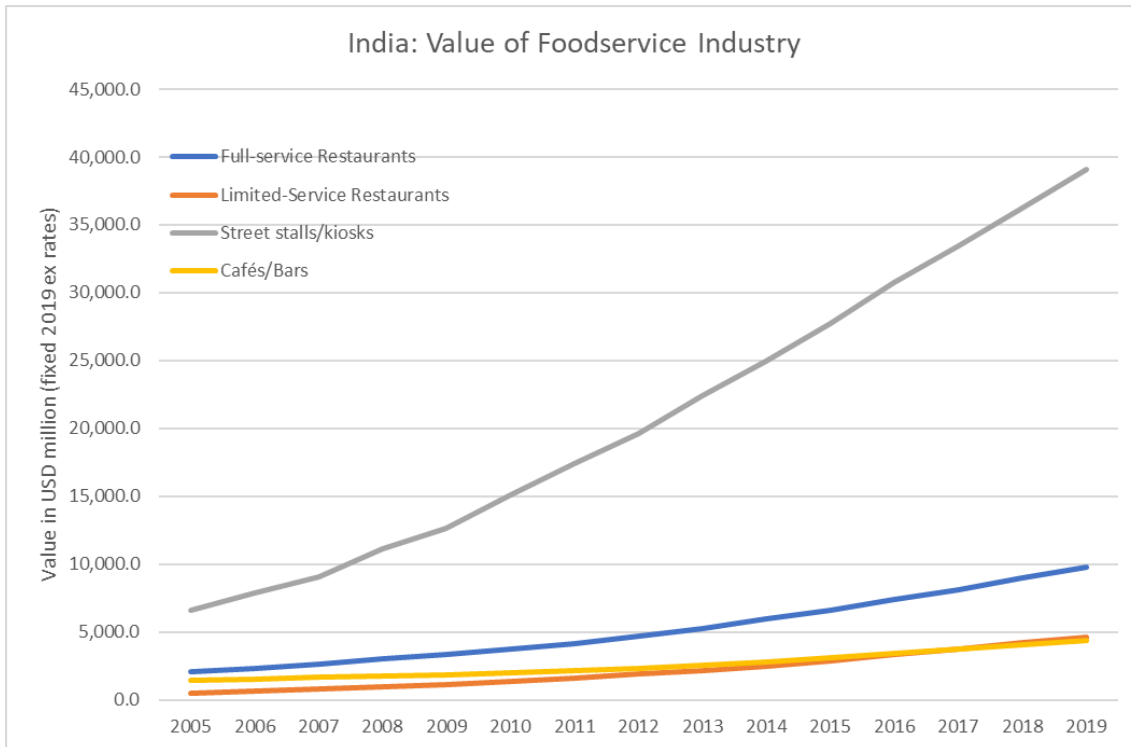


Figure 38 Growth in value of the Food service industry – India

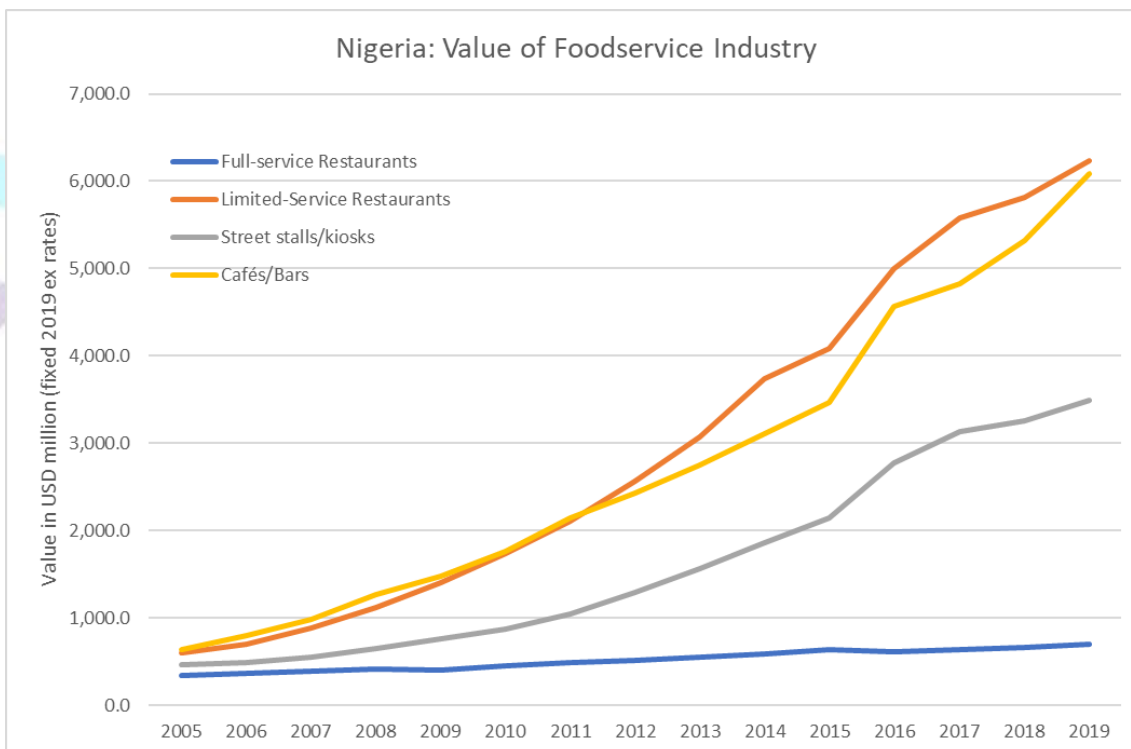


Figure 39 Growth in value of the Food service industry – Nigeria

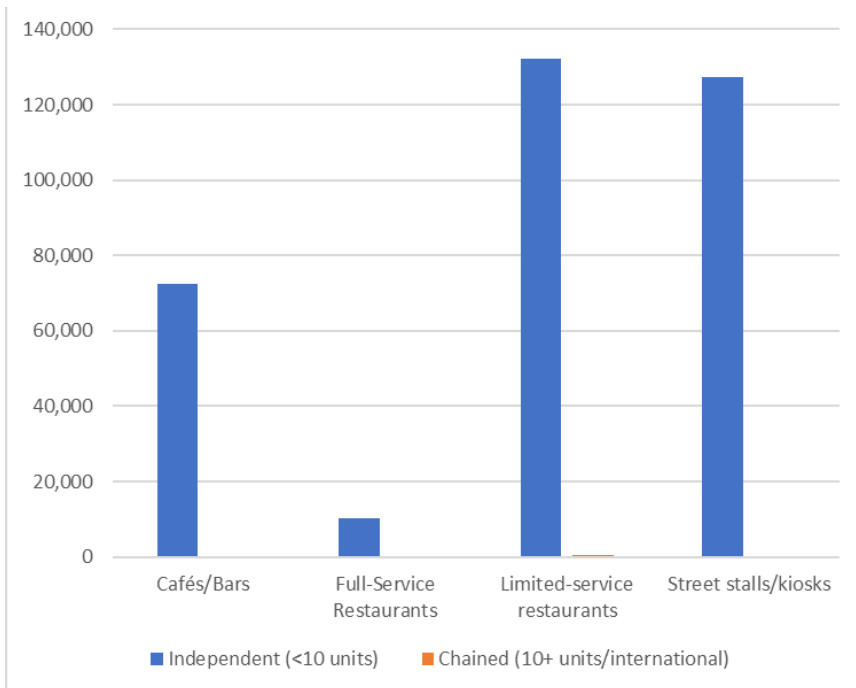


Figure 40 Number of food service outlets (2019) – Nigeria

6.2 Consumer Level: Eating Out Habits

Street food provides a significant proportion of the diet of lower-income groups in the Global South as well as playing an important role in the economy, providing accessible opportunities of employment with low barriers to entry (FAO, 2007). Many academic studies focus on street food specifically (Abrahale et al., 2019) and provide evidence of the importance of street food in the diet of those that live in the Global South. Steyn et al did a systematic review of the nutritional contribution of street foods to the diet of people in developing countries in 2013 (Steyn et al., 2013). From a collection of 23 studies, 19 were set in Sub-Saharan Africa, two in India, and two in Caribbean countries. They conclude that total energy intake from street food ranged between 13-50% of energy for adults, and 13-14% of energy for children. Street food is also a major component of the eating out industry in South-East Asia according to a 2008 book on the subject, which estimates that street foods make up more than 40% of the urban diet (Van Esterik, 2008). ‘Mobile food’, which is street food that serves those travelling, is also described, consisting of easy to carry and consume snacks.

Case study evidence suggests that small, potentially informal restaurants, defined by the food cooked inside and eaten by customers while seated at the premises, are an important aspect of the eating out sector for urban populations in MECS focus countries (FAO, 2007; Petersen et al., 2018), (Adane et al., 2018). Notably, there is a gap in the review literature about restaurants in eating out in Global South contexts. In Rousham et al’s systematic review of dietary habits in Ghana and Kenya, the word ‘restaurant’ does not appear; just fast food and street food are covered when referencing the eating out sector (Rousham et al., 2019). In Lachat et al, reviewing eating out of the home, restaurants are common in discussion of Global North eating out habits but not associated with the four Global South studies reviewed (Lachat et al., 2012).

Moving to a more general focus on eating out, to the best of our knowledge there is no systematic review of eating out habits across all Global South countries, or sub-regions such as Sub-Saharan Africa, and South and South-East Asia. The closest of relevance is Rousham et al, who conducted a systematic review of dietary behaviours for urban Ghana and Kenya in 2019 (Rousham et al., 2019). They found just seven studies that reported on eating out behaviours and conclude that there is insufficient evidence to assess the level of

consumption of fast foods and street foods or whether these were changing. Beyond this, the challenge is to find reviews that are inclusive of Global South studies, rather than being either wholly, or mostly, Global North focused.

Two reviews have some inclusion of Global South studies but are still dominated by research related to the Global North. Janssen et al provide a recent (2018) narrative review on the determinants of takeaway and fast food consumption, but only two studies conducted for Global South countries are integrated into the narrative (Janssen et al., 2018). One is set in India, investigating consumer perception to fast food, and the other in Vietnam, exploring out of home eating by adolescents. There is little evidence and discussion about takeaway and fast food consumption in Global South contexts apart from noting it is also a concern in these areas due to the nutrition transition. The term ‘street foods’ was not included in the literature search which explains why there are limited Global South studies in the review, as street foods are a large proportion of takeaway activity in these countries.



Figure 41 Eating out on the street, Asia CC Pikist 2012

The second systematic review, by Lachat et al, studies how eating out of the home is associated with dietary intake (and did include street food as a search term) (Lachat et al., 2012). Seven studies from low- and middle-income countries were included out of 29, and there was more discussion about how the situation in Global South contexts differed to those in the Global North. In Global South studies, street food was a major source of food eating outside the home, whereas in the Global North the food is from schools, work, restaurants, and fast food. Interestingly, of the main conclusions made by the review, the Global South studies most often contradicted the majority. While for Global North studies there was a positive correlation between eating out and higher intakes of fat, a Benin study contradicted this. Studies from Vietnam and Kenya showed that eating out was associated with better dietary intake in terms of nutritional content, and in Vietnam, better dietary diversity, compared to the majority conclusion from Global North studies. Regarding total daily energy intake, a study of low-income consumers in Nairobi showed no association between eating out and higher energy intakes, whereas this was a majority conclusion from the other studies. A commonality across the Global South studies were that they had smaller data samples, and so during a sensitivity analysis which considered only nationally representative or large cohort data they were removed, leaving the conclusions uncontested. Despite the underpowered nature of the studies, the contradictory conclusions still point to a useful and intuitive conclusion that eating out cultures, impacts, and trends are different between Global North and Global South contexts.

Other reviews on eating out and association with body weight (Bezerra et al., 2011), fast food access (Fleischhacker et al., 2011), and the geography of fast food outlets (Fraser et al., 2010) had no countries from SSA or SSEA, and in one case this is explicitly acknowledged (Fraser et al., 2010), suggesting a dearth of studies to draw on.

However, despite the small number of relevant systematic reviews, there are multiple case studies to draw on that give insight into eating out behaviour and habits for particular contexts and demographic groups. The challenge in synthesis of these case studies, and the reason that few end up included in systematic reviews, are differences in study design. This includes differences in variable measured (frequency of eating out, compared to calorie intake), or scale or scope of study (examining just behaviour around specific locations or food types, such as schools (Fernandes et al., 2017), rather than a complete dietary recall). Lachat et al also describe how eating out habits are often not part of dietary or nutrition surveys, contributing to a lack of data on the subject, and varying definitions and methods of data acquisition reduce the potential to synthesise case studies together (Lachat et al., 2012). To this aim, an EU funded project called 'HECTOR' (Eating out: Habits, determinants and recommendations for consumers and the European catering sector) put together a framework and questionnaire to standardise acquisition of eating-out data, and this would be a useful starting point to improve data gathering for MECS focus countries (Naska, 2006).

One interesting finding concerning consumer behaviour worth highlighting comes from Petersen et al in a study of the informal food sector in Cape Town townships (Petersen et al., 2018). They gather data about where food purchased from street vendors and informal restaurants is consumed, finding that women mostly take it to eat at home, whereas men most commonly eat it on the spot. The study does not delve into the reasons behind these behaviours.

There are more studies about vendors and the food they are selling than consumer behaviour (Abrahale et al., 2019). More studies probing for consumer practices around eating out (focusing on habits and how these fit into their day, rather than calculation of their nutritional or energy consumption) would be advantageous for MECS. Further effort could usefully synthesise the various studies about food vendors, their food sales data, hygiene and safety practices, and their relationship with the informal and formal sectors (including law enforcement) to understand more about the supply side (Adane et al., 2018; Battersby et al., 2016; Dai et al., 2019; Feeley et al., 2011; Hill et al., 2019; Mjoka & Selepe, 2017; Petersen et al., 2018; Sousa et al., 2019).

6.2.1 Rural vs Urban Distinction

Case studies about eating out in the literature often consider just one context and this is most commonly urban. However, two studies consider both, and show that eating out in urban centres is more common than in rural areas. Wenben-Smith et al found that for residents of Dar es Salaam, nearly a third of their food expenditure goes to eating outside of the home (2011-2012 data) (Wenban-Smith et al., 2016). In other urban areas in Tanzania, 14.3% of food expenditure is spent eating out, and by comparison, those in rural areas spent just 7.7% of their food budget on eating out (2014 data). In Cockx et al, the extent of eating out is measured by percentage of calories consumed (Cockx et al., 2019b). Also focused on Tanzania, they report that urbanites consume 10% of their calories outside the home, which is five times that for those living in rural areas (2008-2009 data). Evidence shows a significant difference in eating out behaviour between rural and urban areas.



Figure 42 Forodhani Gardens - Stone Town - Zanzibar - Unguja island - Tanzania, CC David Berkowitz 2011

6.3 Emergence of Online Food Delivery Services

‘If you don’t use delivery apps, you don’t exist.’

– Alex Canter, Canter’s Deli, Los Angeles, and owner of a start-up that aggregates delivery orders from different apps on to one device (Isaac & Yaffe-Bellany, 2019)..

‘A hundred and fifty years ago, most people made their own clothes. I’m fairly convinced that 20 years from now, we will mostly not make our own food.’

– Bob van Dijk, CEO of investor Naspers (Bradshaw, 2019).

The emerging trend of ordering food online is growing in size and significance for restaurant and foodservice industries. The total revenue of the global online food delivery market was USD 107.5 billion in 2019, and is forecast to be USD 136.5 billion in 2020, a 79% increase compared to 2017 (Statista, 2020e). This includes both the restaurant-to-consumer delivery segment, where the restaurant delivers the food, and the platform-to-consumer delivery segment, where the platform handles the delivery process²⁶. Prior to 2019, the restaurant-to-consumer segment was larger than the platform-to-consumer; in 2019, they equalised, and from 2020 platform-to-consumer is forecast to become the majority share (Statista Digital Market Outlook, Online Food

²⁶ Note: for restaurant-to-consumer deliveries, the order may still come in online by an aggregation platform (such as Just Eat), but the restaurant then handles the delivery themselves.

Delivery: Worldwide, n.d.). The countries with the largest revenues in 2020 in online food delivery (shown in Table 2) are China, the United States, India, the United Kingdom, and Brazil, though with regard to user penetration (defined as number of users in the last 12 months), the top countries are Singapore, the Netherlands, Hong Kong, the United Kingdom, and Canada. Globally, the majority of users are in the 25-35-year-old age bracket, with use tailing off in the older generations.

A 2020 study on technological disruptions in restaurant services showed that the term ‘restaurant delivery service’ has increased significantly since 2014, and it is now in use in peer-reviewed and trade literature as often as the term ‘fast food service’ (Khan, 2020). In the USA, the National Restaurant Association have made several predictions about how the industry will change by the year 2030, which serve as a useful indicator for the way things are changing. These include: most takeout and delivery orders will be placed digitally, packaging will become more sophisticated, restaurant infrastructure will change in order to make space for delivery and carry out services, use of technology will increase to increase efficiency (National Restaurant Association, 2019). The association also specifically mentions online food delivery and related aspects as disruptors to be expected to gain prominence in the coming decade, including: increasing consumer loyalty to third party delivery apps, emergence of cloud kitchens and virtual restaurants, autonomous vehicles playing a role in the industry, automation will play a larger role in food preparation. It also predicts that this will change the role of traditional, in-restaurant dining to be more important for socialising, rather than just for eating, as it will be so easy to order food online.

Of interest to the MECS programme is the trend and experience in those countries which are not in the Global North, so a description of the situation in China and India is given here. China has the largest revenue in online food delivery at 51.5 billion USD in 2020 (Statista, 2020a)). In 2018, one fifth of the population had used online food ordering apps (Maimaiti et al., 2018). Maimaiti et al document the changing landscape of food outlets in China, and find through a survey of over 9000 outlets that 42% had a delivery service in some way and of these, 65% were fast-food outlets (Maimaiti et al., 2020). The third-largest market in terms of yearly revenue is India, with market revenue in 2020 of 10 billion USD, and where the number of orders placed through online services was growing at a rate of 15% every quarter in 2019 (Nair & Elangovan, 2020). In 2017, the mobile food-ordering app industry in India was valued at 700 million USD (though this figure is referenced to an as yet unpublished study), and consisted of a large number of small start-up companies alongside UberEats, the food delivery arm of Uber, creating a fiercely competitive environment where companies used significant capital for promotions to gain restaurants and customers (Meenakshi & Sinha, 2019).

Table 2 Revenue of the online food delivery market and user penetration - top 5 countries worldwide and MECS focus countries. (Ordered by decreasing revenue). (From Statista)

	Country	Revenue 2020 (Millions USD)	User penetration %
Countries in the world with largest revenue forecasts for 2020	China	51,514	28.4
	United States	26,527	33.8
	India	10,196	14.8
	United Kingdom	5,988	36.55
	Brazil	3,300	18.8
	Bangladesh	96.4	3.3
	Kenya	31.1	2.5
	Ethiopia	12.5	1
	Ghana	11.6	2

MECS Tier 1 focus countries ²⁷	Tanzania	9.2	1.4
	Uganda	6.1	1.2
	Zambia	3.7	1.2
	Nepal	3.1	1.1
	Rwanda	2.5	0.9
	Malawi	1.1	0.5
MECS Tier 2 focus countries	Nigeria	465.3	4.4
	Myanmar	21.1	2.9
	Cambodia	16.3	3.5
	Cameroon	11.7	1.7
	Gambia (the)	0.2	0.7

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Table 2 compiles 2020 revenue and user penetration data of online food delivery services in the top five countries globally (by revenue size), and also the 15 countries which the MECS programme focuses on. Nigeria is worth attention in this industry. Although South Africa has the largest market on the African continent with a

²⁷ It should be noted that for all MECS tier 1 and tier 2 countries, the data from Statista is not based on in-depth market analysis, but on an ‘algorithm-based calculation’. This is because Statista concentrates on the major global players and all MECS countries are very small markets in comparison.

revenue of 965 million USD (Statista, 2020d), the second largest revenue is in Nigeria at 465 million USD (Statista, 2020c). The restaurant-to-consumer segment is larger than the platform-to-consumer segment, though the platform-to-user segment has experienced higher growth rates and this is expected to continue. As yet, a very small percentage of the population is using these online food delivery services (3% use restaurant-to-consumer delivery services, 2.24% is using platform-to-consumer delivery services). Apart from knowing that 69% users are 18-34 years, there is no further data on socio-economic status, though from the experience of other countries we would expect that it is the well-off urbanites who are using these services. The companies who dominate the market are Jumia Food (50%), Dominos (25%) and two local start-ups called Ofadaa and Areachops (15% combined). In other MECS focused countries, the market is between one and two orders of magnitudes smaller.

Despite the small scale of the activity in MECS focused countries, there is evidence that this is viewed as an emerging trend and that companies are working hard to capture the market. The revenue in Nigeria has almost tripled in size since 2017 to 2020, a much higher rate of increase than seen in the top five countries.

6.3.1 Jumia Food

To gain more insight into the online food delivery industry in MECS focus countries, this section focuses on Jumia Food, the largest online food delivery company in Nigeria and Kenya, where it has 30% of the market, in competition with Dominos and UberEats (Statista, 2020b). It also operates across a further nine Sub-Saharan African countries: Tunisia, Uganda, Senegal, Nigeria, Morocco, Ghana, Algeria, and Ivory Coast. Popular in urban centres with young professionals, after an order is placed on the app, it is confirmed through a phone call from Jumia Food call centre, who then contacts the restaurant and alerts the delivery driver (Mbele-Roberts, 2019). A January 2019 video report containing an interview with Jumia Food staff describes how use had risen ‘exponentially’ over the last two years, which to some degree was explained by it accepting payment by the mobile-money payment mechanism, Mpesa (Mbele-Roberts, 2019). In some countries, it is also possible to purchase groceries through the Jumia Food app.

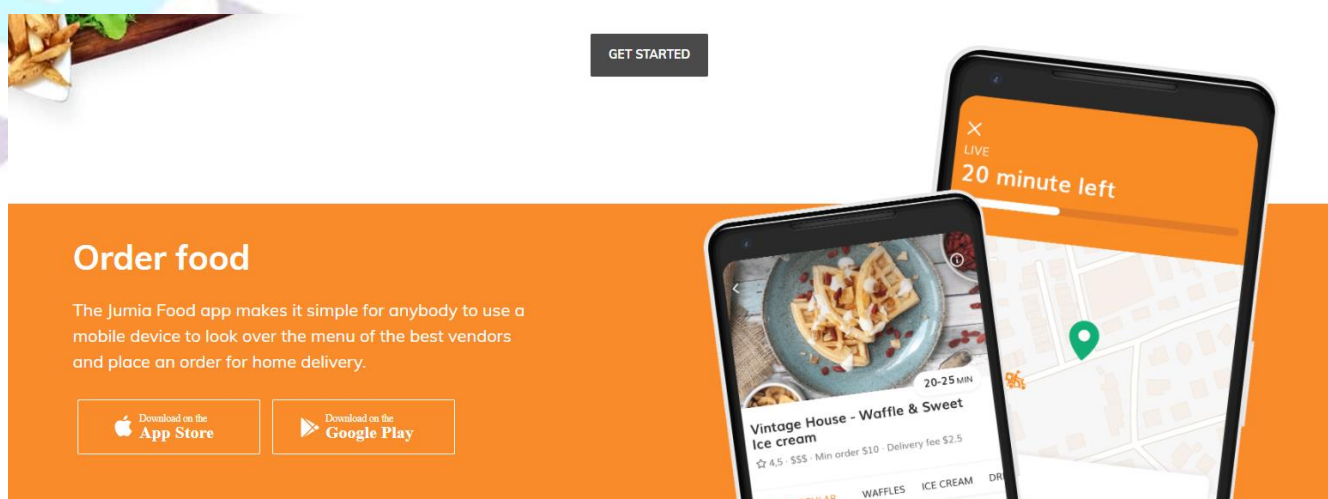


Figure 43 Screen grab <https://food.jumia.co.ke/> Kenya 19/08/2020

However, in the background of Jumia Food is its parent company, the African ecommerce ‘Amazon’ company called Jumia (based in Nigeria), which has had a somewhat rocky history in the last two years. In March 2019 Jumia was reported to be the first African start-up on the New York Stock Exchange (BBC News, 2019). However, an April 2020 news report on BBC news reported its ‘fall from grace’ due to allegations of fraud and concealed losses, complaints of poor quality goods, and a public relations disaster (Madowo, 2020). A year after being

listed on the NY stock exchange, it pulled out of three of the 14 countries it operates in (Tanzania, Rwanda, Cameroon), and its original owner dumped their 11% stake. Jumia has also caused controversy with its identity – although it describes itself as an African company, it does not have African founders, and its executive and technical teams are in Europe and Dubai – leading some to critique it as trying to exploit the continent by co-opting an African identity. Regarding profitability, since starting in 2012, Jumia has yet to be profitable, though aims to be so by 2022.

Recent market commentary about both Jumia and Jumia Food in light of the coronavirus crisis, can be found on the emerging markets analysis website Tellimer, published in short article form by Tellimer Research. The first, focusing on Jumia, describes how the coronavirus crisis has been a ‘godsend’ for ecommerce companies such as Jumia: ‘after losing over 90% of its value in the eight previous months, it rose by 54% in April’ (Tiruchelvam, 2020a). The shutdown of traditional stores have hugely benefitted its main markets of Nigeria, Egypt, and Kenya, and it could be that this shift to use of ecommerce might be the saving of Jumia if it can find further investment and keep costs down.

The second article focuses on Jumia Food in Nigeria and suggests that while coronavirus has led to a 50% increase in items ordered on Jumia Food in March and April (in Nigeria), there are a number of reasons why Jumia Food may still struggle (Tiruchelvam, 2020b). Firstly, food delivery does not gain from the ‘network effect’ which ride-hailing companies do, which is that the value of the platform rises as more people use it. The more people that use Uber, the more the service becomes valuable to rides and drivers, however with food delivery the value stays the same. Due to congested urban centres and the large distances involved, a delivery rider is still limited by the number of deliveries they can make.

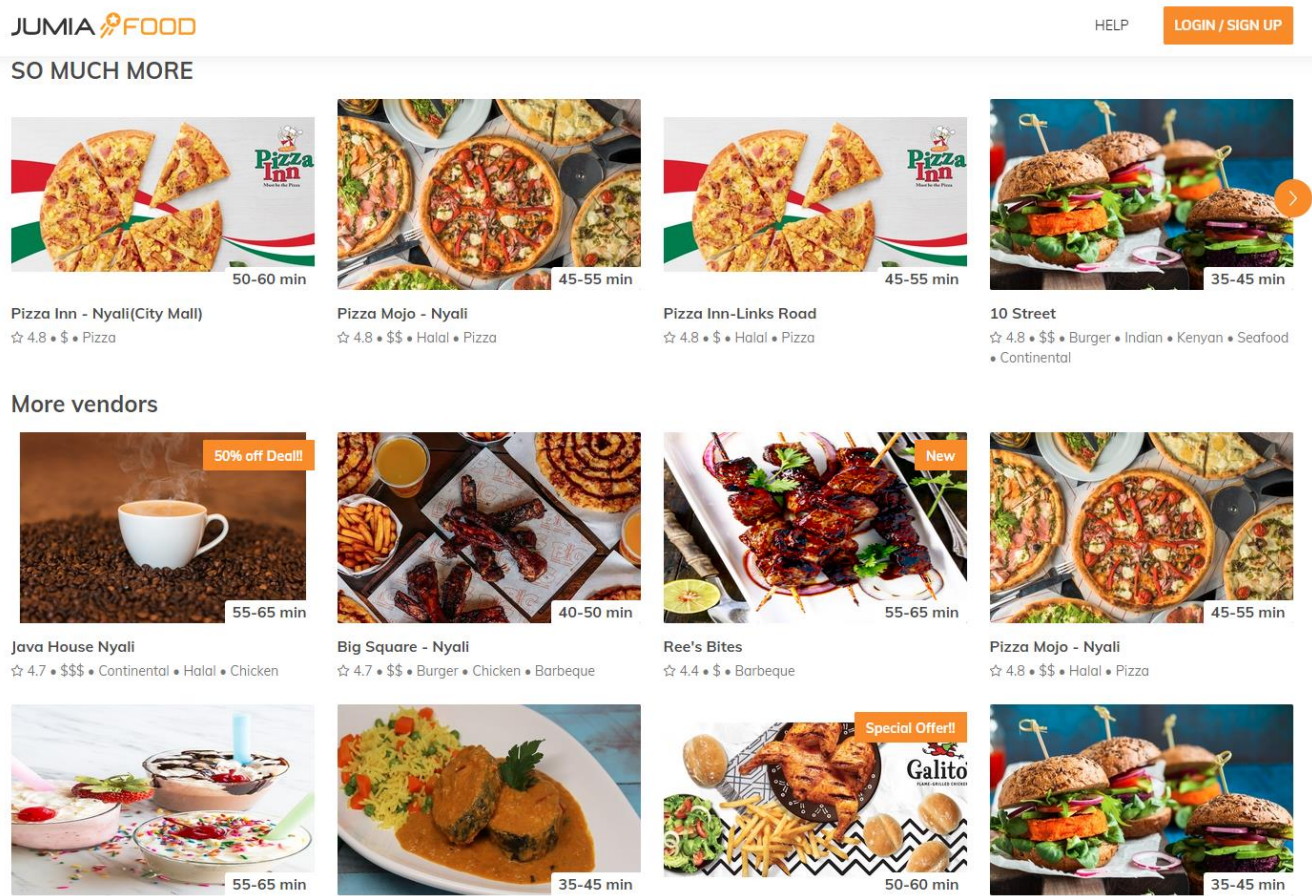


Figure 44 Screen grab for offerings from Jumia at Beach Road area, Mombasa <https://food.jumia.co.ke/restaurants> Aug 2020 Kenya

Secondly, Jumia Food charges a 20% commission to independent restaurants, which may not be sustainable for the restaurants in the future. Thirdly, there is an expectation that the growth currently experience in the online food delivery industry might plateau, because if this growth is currently sustained by the promotional offers, the business will become cash negative. In general, there seems little optimism regarding profitability of Jumia Food. However, the article does suggest that a route to profitability would be the merging of the online food delivery company with a ride-hailing company. In the US, Uber is seeking to acquire Grubhub, an online food delivery company, which it would then merge with UberEats. This synergy between online food delivery companies and ride-hailing companies is interesting and could be considered further in the context of achieving sustainable profit in Global South urban online food delivery industries.

6.3.2 Cloud Kitchens and Virtual Restaurants

Cloud kitchens have emerged alongside the online food delivery market because the online apps provide the bridge to their customers, allowing for a new food outlet model that meets customers increasing demand for takeaways, without any customer-oriented physical infrastructure beyond the food preparation. What is thought to have been the first cloud kitchen was set up in New York City in 2013 by Green Summit Group, who were backed by online food delivery company Grubhub (Isaac & Yaffe-Bellany, 2019). The virtual kitchen produced several brands but shut down in 2017 due to lack of investment, having struggled to make a profit.

However, since then there are increasing numbers of companies experimenting in the virtual kitchen space. Big industry players are getting involved, with companies such as UberEats and Deliveroo experimenting with their own virtual kitchens that satisfy the demand they see customers search for on their apps. Leveraging their customer data, these platforms also work with start-up virtual restaurants to tailor food offerings to what they see their customers search for most, or target existing restaurants, advising them on a local unmet need and encouraging them to start a virtual restaurant out of their existing premises (Isaac & Yaffe-Bellany, 2019).

Apart from online food ordering companies, there are various different approaches taken by start-ups. CloudKitchens operates in the US and the UK, renting out fully kitted out kitchens to companies that want to create virtual restaurants (Pant et al., 2018). Kitchen United, backed by Google, charges a membership fee and offers access to its technology that aggregates orders across multiple apps, and additional services such as dishwashing (Bradshaw, 2019).

Aside from the direct players in the cloud kitchens industry, the cloud kitchen trend has made space for a number of start-ups offering technology or services seeking to support the industry in various ways. For example, there are companies selling software solutions to aggregate orders from multiple apps on to one device (Isaac & Yaffe-Bellany, 2019). The Food Corridor helps people running virtual kitchens to run them with multiple clients more efficiently, and helps connect budding virtual kitchen entrepreneurs to a physical space (The Food Corridor, 2020). This is a quickly moving and rapidly expanding industry, creating space for new start-ups with functions that there was no need for previously.

The advantages to cloud kitchens are that they have low overheads and low capital expenditure on infrastructure, marketing is done through existing mobile food delivery apps, and the restaurants can be quick to adapt and change to suit trends – changing an online presence or offering is much faster than having to change a physical location and associated branding (Colpaart, 2019). This means there is a low barrier to entry into creating a virtual restaurant using a cloud kitchen space. The challenges are that there is a high reliance on delivery apps for customers in an already crowded market place, and a lack of physical premises means walk-in customers don't happen (Colpaart, 2019).

Although not a MECS focused country, cloud kitchens are reaching the African continent through South Africa with the establishment of several virtual kitchens and associated start-ups. Jozi Cloud Kitchens (Jozi Cloud Kitchens Homepage, 2020) are a newly formed cloud kitchen rental company in Johannesburg, providing a ‘turnkey solution for delivery only restaurants’. Their recent formation is evident through their three blog posts, which are all dated to July 2020²⁸. On their website, they state that delivery is the fastest growing sector of the food industry in South Africa, and they claim that rather than spending the 60,000 USD to set up physical premises, virtual kitchens can start with them, retain adaptability, and make use of a fully-equipped kitchen and app-aggregation technology.

We provide turn-key solutions for delivery only restaurants

Introducing cloud kitchens, commercial facilities purpose-built to produce food specifically for delivery. These commissary kitchens are sometimes also known as ghost kitchens, cloud kitchens, or virtual kitchens with the delivery-only food brands operating within them called virtual restaurants.



Figure 45 Partial screen grab for Jozi cloud kitchens <https://jozicloudkitchens.africa/> South Africa Aug 2020.

The blog posts on the Jozi Cloud Kitchens website reference DARTH Kitchens, which owns a cloud kitchen in Cape Town and itself runs several virtual restaurants from it. Following the trend in the US, the brands focus on specific foods, such as ‘Buddy’s Burgers’ and ‘Bagels Schmagels’, all of which are marketed through online delivery apps (Business Insider South Africa, 2019). In December 2019, various news stories appeared about DARTH Kitchens following their award of seed capital from Silvertree Holdings of 300,000 USD for the initial set-up stage and 1.8 million USD for expansion (Tilburg, 2019). One of the founders of DARTH Kitchens is the co-founder of OrderIn, an online food delivery service already operating in the country.

These news stories suggest that South Africa is rapidly expanding in terms of the online food delivery and cloud kitchens industry, with clear evidence of a company renting out cloud kitchen space, and a company owning their own cloud kitchen and creating virtual kitchens from it. This indicates a very early emergence of the formal

²⁸ On close inspection it became apparent these are re-prints of articles, one from Business Insider South Africa and two from medium, all dated to December 2019.

industry, in comparison to the larger markets in the Global North, China and India. Looking to MECS-focus countries, there is evidence that cloud kitchens may be already happening in a less formalised way. A news story from the online Business Daily, a English language daily newspaper in Kenya, was published in November 2018, a full year before the news stories about Darth Kitchens in South Africa(Nyayieka, 2018) . It describes how a small virtual restaurant owner used to get 15 orders a day, and that this has increased to 25 orders a day using three online food ordering apps and orders placed with him personally.

The article covers several other aspects which give more insight into the situation in Nairobi. Yum is one of the smaller online food delivery companies, having 10% market share (in 2020), and in 2018 their sales were 300-450 deliveries a day. There is a noticeable spike in orders each month just after pay day, suggesting perhaps that customers are treating themselves when they have an influx of disposable income. The Jumia Food manager is quoted as describing differences in customer preferences across different countries: Nigerians order local African cuisine, Ghanaians order more salads, and Kenyans and Ugandans share a preference for more international foods and Western-style fast foods. In addition, in describing how the industry is changing in Nairobi, the article states that restaurants are downsizing their seating areas in order to save money and move more business over to delivery.

The small scale of business carried out by the restaurant owner in the article suggests more informality to the sector compared to evidence reviewed in other countries so far – he certainly doesn’t have a website declaring himself a cloud kitchen. It is possible more such small enterprises exist beyond the flashier and image-conscious start-ups, and that the cloud kitchen concept is already occurring on small scales in urban centres. Without further research, it is not possible to know more about this more informal cloud kitchen sector.

The rising trend in online food delivery services and cloud kitchens could be very significant in how eating behaviours change over the next 10 years in MECS focused countries. Even though, thus far, much more activity is seen in the Global North and China and India, use of online food ordering apps is increasing in MECS-focused countries and their continental neighbours, with the cloud kitchen movement taking hold in South Africa. Anecdotal evidence from Kenya suggests cloud kitchens are already happening more informally in Nairobi, where small food outlets are expanding their customer reach by using apps such as Jumia food.

6.4 Drivers of change

Urbanisation and changes in socio-economic circumstances are much discussed in the literature as drivers of change for eating out habits. Many other drivers are associated with the urban environment and are thus linked to urbanisation trends. Firstly, we shall cover urbanisation and socio-economic circumstances and how these influence eating out and current trends. Following this, we will cover the drivers (and one barrier) that exist as a consequence of urbanisation, whose existence is due to the effects of urbanisation and which cannot be detached from it. Finally, we shall cover drivers which standalone without the urbanisation umbrella.

6.4.1 Urbanisation and Socio-economic status

Urbanisation is increasing in SSA and SSEA, and this is often linked to changing eating out habits. Wang et al cites urbanisation as one of the driving factors behind the growth of the fast food industry in China (Wang et al., 2016). Olutayo et al states that the increase in foreign fast food outlets is an urban phenomenon associated with urbanisation. Increased use of fast food is part of the ‘social transformation associated with modernization, westernization, industrialization, and urbanisation’ (Olutayo &



Akanle, 2009). The rising adoption of online food delivery services is associated with an increasing urban population, consumer spending and GDP (Statista, 2019).

However, there is also data to show that urbanization, in terms of the number of people living in urban regions, does not account for all the growth of the foodservice industry. In India, the ‘unorganized segment’²⁹ of the food service is growing 6% per year, whereas the urban population is growing at 2.3% per year (The World Bank, 2020). This suggests that the growth in the unorganized segment of the restaurant and food service industry is not solely down to an increase in urban population – there are other effects meaning that demand and supply for eating out in India is rising.

Two studies have examined what aspect of urbanisation is creating changes in eating out habits, and they shed insight into what other factors are causing change. Cockx et al use survey data for eating behaviour of Tanzanians that migrated from rural to urban areas, with data collected before and after the migration (Cockx et al., 2019b). The aim is to examine what aspects of the change in eating habit can be attributed to the urban or rural environment, and they have a control group who did not make the rural-urban change. Using regression analysis, they show that increased eating out is mostly explained by increased income, and when controlling for income, whether someone has migrated or remained in the rural area is not important. The urban location matters for just a few categories of eating behaviour, and this does not include eating out (they are bread, pasta and other cereal products, and sodas, tea and coffee). The authors suggest that this means we would expect similar changes that we currently see in urban areas in rural areas as soon as income levels rise there – we would expect eating out to increase.

Previous work by Staatz et al corroborates this (“Agricultural Growth in West Africa: Market and Policy Drivers,” 2015). They calculate income elasticities of different categories of food demand across West African countries between 2002-2012. Elasticity estimates for eating outside the home (only available for three countries) are the highest across all other categories (such as meat, dairy, etc.), suggesting demand for eating out increases at the fastest rate as income rises. For urban areas, it is estimated to increase at two times the rate of per capita income growth, and in rural areas, it is higher than this at 2.26. This again shows that changing diets are not just an urban phenomenon, and that change is expected at a faster rate in rural areas as incomes rise there. These analyses from Cockx et al and Staatz et al are important in order to understand the underlying dynamics and pathways that are behind changing eating out habits.

Income is one factor that makes up socio-economic status. Multiple other studies have investigated how socio-economic status might influence eating out. Van Riet et al studied the role of street food in diets of people living in two areas in Nairobi; one a slum and another a low-middle income area (Riet et al., 2001). They find that four factors are associated with high street food consumption, three of which are aspects of socio-economic status: household income, regularity of income, and household size. In a study about the eating habits of Ghanaian school children, those with pocket money were able to buy food from independent vendors outside schools (Fernandes et al., 2017). Several indicators for bringing pocket money were aspects of socio-economic status, such as the child not being registered for free school meals, household asset score, and urban location. On the other hand, Gewa et al found that for rural school children in Kenya, there was so association between eating out of the home and socio-economic status in their particular study (Gewa et al., 2007).

Steyn et al assessed how street food and fast food consumption changes across provinces in South Africa and find that socio-economic status is a significant differentiator in behaviour (Steyn et al., 2011). Those with medium socio-economic status were the highest consumers of street food, whereas those in the high socio-

²⁹ The unorganized segment comprises ‘individuals or families selling ready to eat food through vendors, dhabas 1 , food carts, street stall and more’. (Statista Research Department, 2016)

economic category were the highest consumers of fast food. Fast food intake was related to possessing large household appliances and being in employment, effects which were less strong in street food intake.

A related driver to socio-economic status on eating out behaviour is the cost of the product. A large study in 11 Latin American countries showed that for young people, low cost of street food is one of their main drivers for choosing to eat it (Durán-agüero et al., 2018). For consumers of street food and customers of informal restaurants in Cape Town, price of the food was one reason for purchasing from the informal foodservice, though it was not so important as taste and convenience (Petersen et al., 2018).

6.4.2 Markets vs Own Food Production

Moving to urban areas from rural areas reduces involvement in growing one’s own food and creates more dependency on other convenient foods such as those purchased out of the home. Cockx et al find that the move out of agriculture caused by rural to urban migration in Tanzania helps to explain the increase in eating out that occurs in the urban environment (Cockx et al., 2019b). Similarly, in West Africa, people are becoming increasingly reliant on purchasing food through markets rather than making it themselves (Staatz & Hollinger, 2016).



6.4.3 Fast Food Outlet Chains

Ivory Coast, Ghana, Nigeria and Senegal have seen a growth in regional and international foodservice chains pushing into urban areas (Staatz & Hollinger, 2016). The strong South African fast-food chains have made it challenging for international newcomers to make much of a mark on the South African foodservice industry, and so they are pushing into other SSA countries (Friend, 2014). As Nigeria is the second largest foodservice market in SSA, it has become a target for international chains; in 2014 Domino’s Pizza expanded into five locations (Friend, 2014). KFC set-up in Nigeria in 2009 and in 2012-2013 extended into 11 other SSA countries (Shereen Tuff, 2015). Apart from international chains, South African chains are also pushing into other SSA countries, and there are country-own chains which have grown rapidly over the last few decades, such as Mr Bigg’s in Nigeria, which now has largest market share with 170 outlets in the country. Expansion of international and regional chains is accompanied by aggressive advertising which also serves to influence consumer eating out habits.



The following drivers can stand alone from the over-arching urbanisation theme.

6.4.4 Evolving Aspirations and Values

Another driver of eating out, particularly for fast foods, is the value and identity connotations of its consumption and that it is aspirational. Reviewing the rise of foreign fast food in Nigeria, Olutayo et al describes how it represents ‘class, status and wealth structures’ (Olutayo & Akanle, 2009). Kroll et al, investigating ‘foodways’ of the South African poor, states that ‘the symbolic and aspirational domain of food aesthetics and the social functions of visible consumption as symbols of wealth are key forces shaping the foodways of the poor’ (Kroll, 2016).



Customers of foreign fast food outlets in Nigeria interviewed by Olutayo et al describe how it’s a ‘class thing’, and that they want to appear to be able to afford it, to show they are doing well and have not been left behind (Olutayo & Akanle, 2009). It is a symbol of social status and used to impress. One customer describes how men will take their dates there to show they are well-off and so would be good providers, and another explains how their friend took them to Mr Bigg’s to celebrate a birthday and bragged about it. A key aspect of this value

attachment is the aspiration for ‘Western’ lifestyles; as described by one customer, “it gives a feeling of being in the West”.

One cause of these changing consumer preferences is increased exposure to media and social media, particularly in young people (Olutayo & Akanle, 2009; Staatz & Hollinger, 2016). Another cause is advertising. Kigaru et al showed that Nairobi school children who had access to TV’s ate more fast food, and they postulate that this could be due to the large number of food advertisements which are almost all about unhealthy processed and fast foods (Kigaru et al., 2016). Studies have shown that advertisements influence children’s dietary requests and habits, and it was such a cause for concern that the WHO published a set of recommendations on marketing foods and beverages for children to protect them (WHO, 2010) . Kigaru et al warn that ‘the concept of ‘food’ has changed from a means of nourishment to a marker of lifestyle and a source of pleasure as portrayed by social media’ (Kigaru et al., 2016).

6.4.5 Demographics: youth bulge

The shape of population pyramids for MECS focused countries show that they are young populations with ‘youth bulges’. This is linked to the previous driver of evolving aspirations and values, because it is the youth who are more likely to more frequently use media and social media, and so be influenced by advertising (Staatz & Hollinger, 2016). There is also case study evidence that young people like and consume fast food and street food more than older sectors of society. In Nigeria, foreign fast food restaurants are frequented by more young people than older generations (Olutayo & Akanle, 2009), and two systematic reviews find that young adults eat more fast food, or eat more food outside the home in general, compared to older people (Janssen et al., 2018; Lachat et al., 2012). (However, it should be noted that these reviews were mostly informed by Global North studies.)



6.4.6 Convenience and Time

Consuming street food and fast food for reasons of limited time, to save time, or due to convenience, are significant drivers. (Although there can be time-related factors which weigh into whether something is convenient or not, we also view convenience as including effort.)



In a survey about fast-food consumption among young adults in Johannesburg, Van Zyl et al found that a lack of time and the convenience were the main motivational reasons behind choosing to eat fast food, more so than taste (Van Zyl et al., 2010). In Kampala, people consumed fast foods due to convenience and taste (Ayo et al., 2012). In China, Wang et al finds that the time and convenience-related reasons of the quick service offered at outlets and busier lifestyles of the population (among other factors) have stimulated demand for fast food outlets (Wang et al., 2016).

In a study about the role of street food for those living in a slum and a low-middle income area in Nairobi, Van Riet et al found that a lack of time to produce meals at home (among other factors) was linked to increased street food consumption (Riet et al., 2001). In other cases, convenience was a secondary reason for consumption, such as in a study by Petersen et al about consumption of street food in Cape Town townships (Petersen et al., 2018). Seventy-one percent of people stated that they purchased the street food for taste reasons, whereas just 12% said convenience.

There is some evidence that the importance time saving in eating out varies according to demographics. In a study across 11 Latin American countries, it was found that for 18-30 year olds, street food was preferred to save time (and cost), whereas over 30 years olds were motivated by the taste and availability of the street food (Durán-agüero et al., 2018).

6.4.7 Taste

Various studies show that the taste of a food is an important reason for consumption of street foods and fast foods in the Global South. In a study of the informal food sector in South African townships around Cape Town, finding the food ‘tasty’ and liking the flavour was the majority reason (71%) behind purchasing food from street vendors or informal restaurants (Petersen et al., 2018). Regarding fast food in Kampala, Ayo et al found that the 90% of residents who ate fast food were partially motivated by taste (along with convenience) (Ayo et al., 2012). However, in Johannesburg, taste was a secondary reason for choosing to eat fast food behind time saving and convenience, though not significantly (Van Zyl et al., 2010).



As discussed for time and convenience, a large study across 11 Latin American countries showed that motivations for eating out varied according to demographic group. Taste was the main motivation of over 30-year-olds in the consumption of street food (Durán-agüero et al., 2018). Different drivers (cost and time saving) were driving the choices of 18-30 years old in choosing to eat street food.

7 Consumer Food Waste

7.1 Food waste and Sustainable Development

Food loss and waste has been adopted as part of the Sustainable Development Goals; Target 12.3:

“By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.”³⁰

Note that this target specifically addresses food waste at the consumer level. Taking a Sub-Saharan African perspective, Sheahan & Barrett (2017) identify four objectives for reducing post-harvest losses that lie behind this target:

- Food security – improve availability, access, utilisation, and stability;
- Food safety – where consumers cannot detect that food is spoiled or contaminated, consumption can result in adverse health effects (spoilage undetected);
- Reduce unnecessary resource use – agricultural inputs (e.g. water, chemicals, labour) and inputs in the value chain (e.g. transport, processing energy);
- Increased profits in food chain, especially for smallholder farmers.

In addition to this, there are implications of food loss and waste on climate change. For example, the total annual carbon footprint of global food loss and waste amounts to 4.4 GtCO₂e (FAO, 2015b).

7.2 Food waste and post-harvest losses – the data

Figure 46 shows that the per capita food loss in Europe and North-America is 280-300 kg/year. In Sub-Saharan Africa and South and South-East Asia it is around half this level at 120-170 kg/year (FAO, 2011). However, this represents losses across the entire food supply chain. The total per capita production of edible food for human consumption is approximately 900 kg/year in Europe and North-America, and approximately 460 kg/year in

³⁰<http://www.fao.org/sustainable-development-goals/indicators/1231/en/#:~:text=By%202030%2C%20halve%20per%20capita,%2C%20including%20post%2Dharvest%20losses.>

Sub-Saharan Africa and South and South-East Asia. These figures imply that total food loss as a proportion of total food consumption is consistent across Europe/North America and Sub-Saharan Africa and South and South-East Asia at approximately one third.

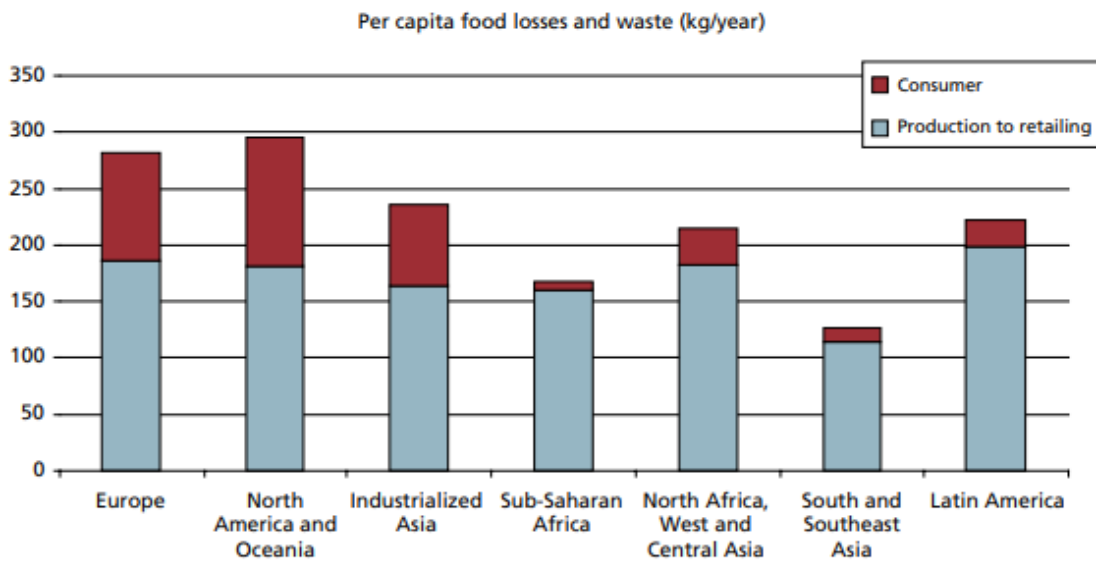


Figure 46 Per capita food losses and waste by region (FAO, 2011)

This figure also clearly illustrates a fundamental difference in the nature of food loss and waste between developed and developing countries. In Sub-Saharan Africa and South and South-East Asia, food is almost exclusively lost in the food supply chain – the amount of food wasted at the household level (consumer waste) is relatively small. Per capita consumer food waste is 6-11 kg/year, which accounts for approximately 5% of the total food loss and waste. This is in contrast with Europe and North America, where food supply chains are more efficient but consumer waste accounts for a much larger proportion of waste and losses. In these regions, per capita consumer food waste is 95-115 kg/year, which accounts for nearly 40% of the total food loss and waste.

These figures for consumer food waste in developing countries are consistent with other studies in South Africa. Overall annual food loss in South Africa was estimated at 177 kg/capita, of which consumer food waste was estimated to be only 7kg/capita, equivalent to 4% (Oelofse & Nahman, 2013). Ramukhwatho et al (2014) summarise other studies on urban waste composition in South Africa that estimate the proportion of putrescible waste (assumed to represent food) in total household waste:

- Studies in Pretoria and Johannesburg found that the proportion of putrescible wastes was highest among low income areas and the central business area; high income areas had higher proportions of garden waste;
- A study on Rustenburg municipal area (outside of Johannesburg) found the proportion of putrescible waste was 27% in low income areas of Johannesburg, 13% in middle income areas, and 17% in high income areas;
- A city of Cape Town study found kitchen waste made up 8% of household waste in low income communities, 9% in middle income and 5% in high income communities;
- Another study found that across Cape Town as a whole, food waste accounts for 13% of residential waste.

These studies suggest a couple of trends:

- The proportion of food in domestic waste is highest among low income communities; this does not mean that food waste is higher in low income communities, as the total amount of domestic waste will be lower in these communities;
- The proportion of food in domestic waste is lower in rural areas; similarly, this does not mean that food waste is necessary higher in urban areas, rather people in rural households tend to have more opportunities for utilising food waste, e.g. animal feed.

The FAO report goes on to disaggregate where in the food supply chain loss and waste occurs for different types of foods. This shows that loss and waste (expressed as a proportion of initial production) is higher in developing country regions for certain foods (than in Europe and North America): oilseeds and pulses, and fruit and vegetables, meat and dairy. However, consumer waste still accounts for relatively low proportions of loss and waste in all of these categories (Table 3 gives figures for Sub-Saharan Africa as an example).

Table 3 Estimated/assumed waste percentages for each commodity group in each step of the FSC for Sub-Saharan Africa (from FAO, 2011)

	Agricultural production (%)	Postharvest handling and storage (%)	Processing (%)	Distribution (%)	Consumption (%)	Total (%)
Cereals	6.0	8.0	3.5	2.0	1.0	20.5
Roots and tubers	14.0	18.0	15.0	5.0	2.0	54.0
Oil seeds and pulses	12.0	8.0	8.0	2.0	1.0	31.0
Fruit and vegetables	10.0	9.0	25.0	17.0	5.0	66.0
Meat	15.0	0.7	5.0	7.0	2.0	29.7
Fish/seafood	5.7	6.0	9.0	15.0	2.0	37.7
Milk	6.0	11.0	0.1	10.0	0.1	27.2

Given that efforts to reduce food loss and waste will focus on these parts of the food supply chain where losses are highest, these studies indicate that consumer food waste at the household level is not a priority area. However, this is the area of interest for the MECS programme.

7.3 Causes of food waste

The importance of food in the household budget diminishes with economic prosperity. For example, household expenditure on food in the United States increased from 35% in 1937 to 5-10% in 2012 (Buchner et al., 2012). The data presented in Section 7.2 highlight a clear link between economic prosperity and higher levels of consumer food waste. As levels of disposable income increase, spending on food decreases and people become less concerned about wasting food.

Avoidable consumer food waste is essentially due to two factors:

- Cooking too much food;
- Not using food soon enough, i.e. before it goes off.

Reasons behind food waste identified by Buchner et al. (2012) relate mostly to wasting food before it is cooked:

- Confusion over food labelling, especially systems intended to provide guidance on when foods are likely to be unsafe to eat ('sell by' dates);
- Poor planning of purchases - leads to the purchase of excessive quantities of food, e.g. taking advantage of promotional offers;
- Improper food storage (and little attention to the instructions stated on the labels)
- Inadequate wrapping – means foods will perish sooner.

- Limited knowledge of methods to consume more efficiently and reduce waste (e.g., how to use leftovers from meals in another way or how to create dishes with available ingredients);
- Lack of awareness of the economic and environmental impact of waste.

A study on Sub-Saharan Africa also identifies purchasing behaviour as a key factor causing consumer food waste (e.g. buying in bulk) (Appendix to Sheahan & Barrett, 2017). However, they also highlight lack of refrigeration and other food storage capacities, which can reduce the impact of both excess food cooked and food reaching the end of its shelf life.

Reasons for cooking too much food are related to skill, awareness, and education, which can lead to poor planning of cooking. The correct amounts to cook are specified in recipes, so food is more likely to be wasted in households that do not have access to written down recipes or in which the cook faces literacy constraints – both in terms of being able to read and the availability of recipes in local languages. Bear in mind that cooks are more likely to be cautious and err on the side of cooking too much rather than too little. Increasing the frequency of cooking a meal helps cooks judge correct portion sizes. A limited menu of meals helps reduce waste by increasing the frequency of cooking, and by reducing the use of ‘unusual’ ingredients that get spoiled when left in the cupboard (Schanes et al., 2018).

The quantity of food cooked is closely linked to issues of status. This is most likely to lead to food waste in the context of entertaining or banquets as social events. However, it may also translate into everyday-eating practices within the household. For example, throwing out excess food on a daily basis may be a way of expressing social status within a neighbourhood.

The generation of food waste is a behavioural issue and, as such, would be expected to vary by demographic and cultural contexts. Buchner et al. (2012) and WRAP (2020) (a UK study) have identified the following factors as determinants of food waste generation:

- Family size and composition (adults waste more than children in absolute terms, and larger families waste less per person compared to smaller families);
- Family income (food waste is less in low-income families);
- Culture of origin (for example, in the United States, families of Hispanic origin waste 25% less than non-Hispanic families);
- Gender (women on average waste more than men).
- Age (older people report lower levels of food waste and have better purchasing and refrigerator management skills).

Having said that, a more recent systematic review concluded that the empirical evidence for linkages between socio-demographic factors and the generation of food waste was not clear (Schanes et al., 2018). Other studies go on to argue that relatively rapid changes in the demographic composition of populations in developing countries are conspiring to increase consumer food waste (Sheahan & Barrett, 2017, Appendix):

- Economic development leading to higher levels of disposable income;
- Smaller household sizes due to, e.g. couples having children later, growth in single headed households (as couples separate), migrant labour;
- Increasing urbanisation – increasing hours in employment (including women joining the work force) mean consumers’ priority shifts from cost to convenience.

On the other hand, rising incomes mean that consumers are better able to pay premium prices for processed foods that not only offer convenience, but also have improved shelf life, which can reduce waste.

7.4 Domestic refrigerators

This section is dedicated to exploring access to domestic refrigeration, given its pivotal role in reducing consumer food waste. European centric studies on consumer food waste do not specifically mention the role of domestic refrigerators in reducing waste, presumably because households have universal access to electricity and have almost universal ownership of fridges. However, it is mentioned in studies relating to developing countries (Sheahan & Barrett, 2017). Dietary changes in developing countries (see Section 4) mean that people are consuming more meat, fish and fresh fruit and vegetables, all of which are more perishable than more traditional foods such as grains and pulses. Therefore, refrigeration will play a role not only in reducing waste but also in improving dietary diversity and nutritional outcomes. Reusing leftovers is one of the most effective ways of reducing food waste (Schanes et al., 2018) so, given the higher ambient temperatures in kitchens in developing countries, refrigeration has even greater significance.

The household penetration of refrigerators is 100% in Europe and the United States, but only 30% in India, and 17% in Sub-Saharan Africa (Efficiency for Access Coalition, 2019). However, ownership in developing countries is expected to rise (see Figure 47). Indeed domestic refrigeration is the stationary refrigeration sub-sector that is expected to grow most (Peters, 2018). In addition to almost universal ownership in the United States, 30% of U.S. households have more than one refrigerator³¹, which means that penetration figures can be difficult to interpret. Data from 2015 indicate that per capita ownership was approximately 0.5, which is consistent with Figure 47.

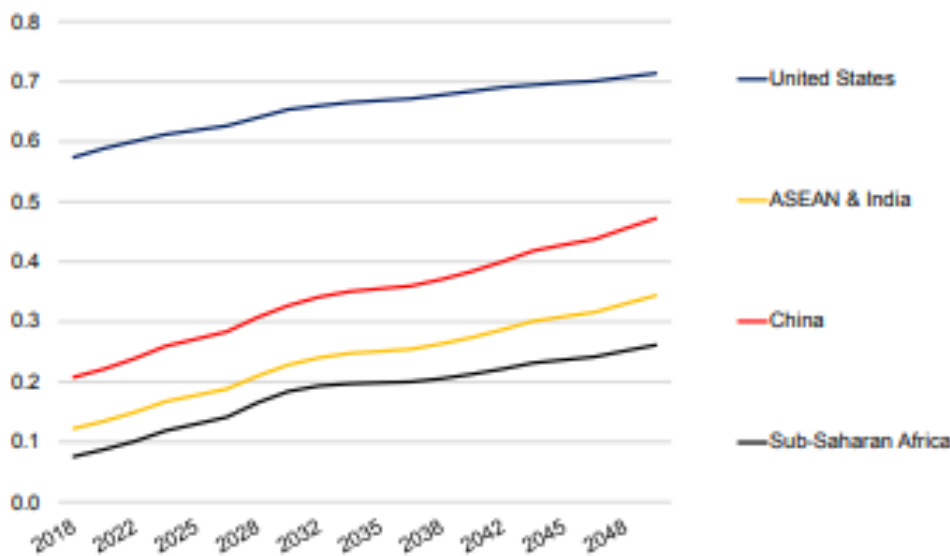


Figure 47 Per capita domestic refrigeration equipment by region (Peters, 2018)

A recent market survey indicates that people regard refrigerators as offering high, positive impact on their livelihoods; only lighting and mobile phones were regarded as having greater potential for impact (Efficiency for Access Coalition, 2018). The increase in domestic refrigeration will have widespread implications, which provide a more detailed understating of those perceptions of impact (drawn from Peters, 2018):

- Change of diet due to an increase in consumption of processed foods and convenience products that require refrigeration;

³¹ <https://www.statista.com/statistics/857221/us-households-using-refrigerator/>

- Change of cooking practices such as increasing use of microwaves for heating processed foods and reheating leftovers;
- Change in cooking skills reflecting changes in foods cooked and improved food safety;
- The ability to consume perishable foods (e.g. meat, dairy) will improved nutritional outcomes;
- Health outcomes can be improved as a result of improved food safety;
- Markets may change as people can shop more infrequently;
- Liberated time as a consequence of the ability to consume convenience foods, and the ability to purchase foods more infrequently.

Lack of access to modern energy, primarily electricity, is a key constraint to reducing losses in the food supply chain because it is required for refrigeration and for food processing technologies. Access to electricity is a prerequisite for ownership of domestic refrigerators. Eight-hundred and forty million people lived without access to electricity in 2017³² and this figure is on a downward trend. Electricity is also crucially important elsewhere in the food supply chain. For example, Figure 48 illustrates the importance of electricity in a number of food processing industries in the USA. It is also interesting to note that these proportions are remarkably constant across different processing industries. Access to electricity is integrated into the Sustainable Development Goals – SDG 7 is “Ensure access to affordable, reliable, sustainable and modern energy for all”. Plenty of literature exists on the topic, so it will not be discussed further in this document.

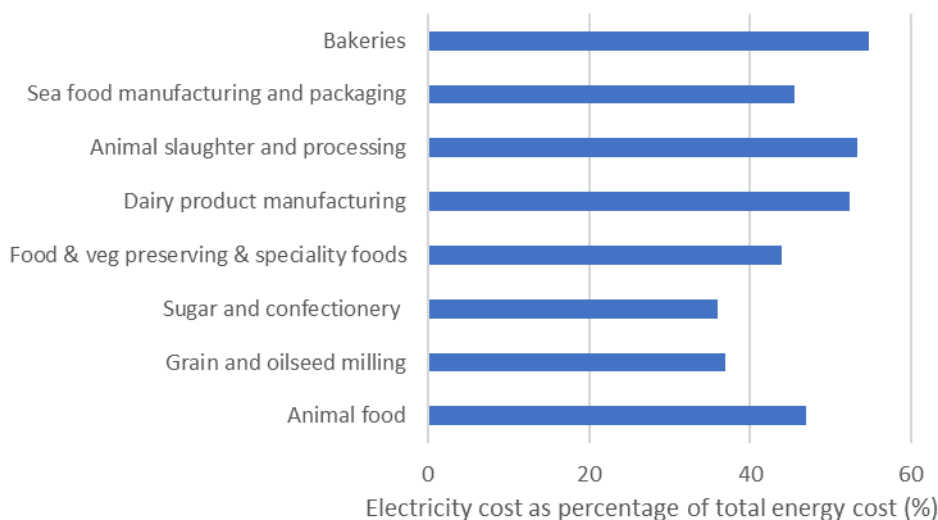


Figure 48 Proportion of energy costs on electricity – food processing in USA (2006) (FAO, 2016)

In addition to lack of access to electricity, other factors behind low adoption of domestic refrigeration include (Efficiency for Access Coalition, 2018):

- Poor transport infrastructure, which adds to the cost of delivering large appliances, especially to rural areas;
- A lack of low cost refrigerators;
- High costs of electricity to run refrigerators;
- Lack of consumer finance.

³² <https://unstats.un.org/sdgs/report/2019/goal-07/>

A number of organisations such as CLASP³³ and the Efficiency for Access Coalition³⁴ are concerned with reducing the energy consumption of everyday appliances, with a focus on developing countries. For example, the Low Energy Inclusive Appliances (LEIA) Programme aims to both increase the efficiency and decrease the cost of electrical appliances³⁵. Interestingly, much of the literature on domestic refrigerators has concentrated on the potential for off-grid systems. The driving factor here is efficiency, as the electricity consumption of a standard fridge would dwarf the consumption of other appliances such as LED lights and phone chargers, which would require larger and more expensive energy generating capacity on solar home systems or mini-grids. The estimated annual energy consumption of a phone charger and low power lamp is approximately 20 Wh, compared with 1,000 Wh for a small fridge (Global LEAP, 2016). The cost of running a standard fridge on a mini-grid would also be relatively high, given that mini-grid electricity tariffs are considerably higher than utility tariffs. For example, the levelized cost of operating solar micro-grids in example Sub-Saharan African countries is estimated to be approximately \$1.00/kWh, which compares with the highest tier of domestic tariffs in Ghana, for example, of \$0.23/kWh (Reber et al., 2018).



Figure 49 Image from 2019 Buyer's Guide for Outstanding Off-Grid Refrigerators Global Leap CC Clasp 2019

The interest in off-grid applications is also a consequence of the sheer numbers of people now served by such grid systems, estimated at over 130 million people in 2016 (IRENA, 2018). Solar systems account for the greatest share of growth, driven by falling costs of photovoltaic panels. However, any progress in capital cost and

³³ <https://clasp.ngo/>

³⁴ <https://efficiencyforaccess.org/>

³⁵ <https://efficiencyforaccess.org/leia>

efficiency would also serve to expand access to domestic refrigerators among households with grid electricity supplies.

Technical innovations that can improved refrigerator efficiency include (Park et al., 2019):

- Improved insulation – through thicker insulation or the used of vacuum insulation panels;
- More efficient compressors – larger compressors have a higher refrigeration coefficient of performance (COP);
- Variable speed motors – operate continually at part load rather than switching on/off.

Policy interventions, notably appliance energy efficiency labelling and minimum energy performance standards have also been shown to be effective in raising efficiency standards (Shah, Nihar, Won Young Park, Nicholas Bojda, Michael A. McNeil, 2014).

In addition to technical and policy approaches, an example of innovative thinking to overcome barriers to access to domestic refrigeration is the community fridge. Set up as a movement to address food poverty and to reduce food waste in Europe and north America, it is based on the simple idea of installing a refrigerator in a public space (e.g. community centres, churches) so that people with excess food can put it in the fridge, and others can take and use it, free of charge³⁶.

Cooking fuel cost savings linked to domestic refrigeration have not been mentioned in the above studies. A study on solar home systems in Kenya makes the observation that household run businesses can clearly identify the financial value that a refrigerator can make to their business, whereas households find this kind of calculation more difficult. This means that households are more reluctant to pay current prices (Sanni et al., 2019). The study estimated weekly average cost savings from owning a refrigerator (see Table 4), of which a reduction in cooking fuel use accounted for 10%. This is the only publication found that makes specific reference to cooking fuel savings, but note that this estimate is based on respondent perceptions only.

Table 4 Refrigerator weekly average household cost savings (Sanni et al., 2019)

	Weekly saving (KES)	Percent of total savings (%)
Bulk purchasing and transportation	193	40%
Fresh food spoilage	122	25%
Cooked food spoilage	120	25%
Cooking fuel savings	48	10%
Total	483	100%

7.5 Other approaches to reducing food waste

7.5.1 A priority in developed countries

Food waste is recognised as having important environmental, social and economic implications, and is receiving increasing attention among businesses, NGOs and governments. Stöckli et al. (2018) assert that NGOs and public opinion have led efforts to raise awareness of these issues and that academic studies have only recently started to catch up. Schanes et al. (2018) observed that the number of food waste related papers more than doubled in the five years up to 2018. However, most of this literature addresses approaches to consumer food waste in developed countries. Bear in mind that consumer food waste accounts for the largest part of total food loss and waste in in developed countries (see fig 31), which explains the high level of interest in the topic.

³⁶ <https://www.globalcitizen.org/en/content/fridges-freeze-out-food-waste/>

7.5.2 Information and persuasion

Studies (with an exclusively developed country focus) show that people are aware that wasting food is an undesirable behaviour, and that an understanding of the financial social and environmental implications of food waste is linked to more positive behaviours (Schanes et al., 2018). Therefore, many interventions are based on providing information as a means of changing norms and, eventually, behaviour.

Stöckli et al., (2018) make a distinction between antecedent and consequence types of information based approaches. Antecedent includes:

- Informational intervention – providing information on the negative consequences of waste;
- Prompts – to remind people to carry out positive behaviours;
- Modelling – demonstrating positive behaviour e.g. video.

Consequence interventions are appropriate when people have already adopted a positive intention to carry out positive behaviours, and aim to encourage them to successfully execute those behaviours. These include feedback, rewards and penalties. The BinCam app, for example, takes pictures of waste being thrown away and posts them on social media platforms (Ibid). A recent study of mobile phone apps designed to help manage municipal waste divided the informational approach into yet more detailed categories (Suruliraj et al., 2020).

While information campaigns are the most commonly used approach to reducing food waste, there appears to be a growing consensus that providing information alone is not enough. Information must be carefully tailored and works better when integrated with other approaches (Hebrok & Boks, 2017), (van der Haar et al.³⁷), (Schanes et al., 2018), (Stöckli et al., 2018).

It is interesting to note that behaviours are dominated by personal norms rather than subjective norms. This means that, at least in developed countries, people are not motivated to reduce food waste by what other people think (e.g. friends, neighbours, family); this may not be the case in the different social and cultural contexts of developing countries. On the other hand, behavioural control is important in enabling people to adopt positive behaviours (Schanes et al., 2018). This means that people who feel they can do something are more likely to adopt positive behaviours, so tools that help people take action are important.

7.5.3 Technology and interventions

Many studies point out that there is little robust evidence for the effectiveness or otherwise of interventions, tools, or policies, a gap which Reynolds et al. (2019) attempted to fill. Despite identifying some studies that showed positive effects, they concluded that many approaches are not yet backed up by quantified evidence of effectiveness. This section is, therefore, restricted mainly to a description of technology enabled interventions rather than a critical assessment of effectiveness.

Packaging

This is one of the most studied approaches to reducing food waste and has potential benefits throughout the food supply chain, from processor to consumer. Issues include (Hebrok & Boks, 2017):

- Preservation technologies;
- Environmental impact of packaging;
- Date labelling;

³⁷ <https://edepot.wur.nl/519161>

- Storage guidance;
- Pack sizes;
- Self-dispensing systems;
- Supply chain packaging.

Food processing and packing technology continues to develop in ways that prolong shelf life and reduce transport costs.

Information on food

The debate on date labelling of foods continues in developed nations, trying to find the right balance between ensuring food safety and health on the one hand and systems that cause confusion and potentially lead to unnecessary waste on the other (mentioned in Section 7.3 above). Labelling is in the domain of policy makers, food manufacturers, and large-scale retailers. Technology offers solutions such as dynamic pricing. Products such as Wasteless³⁸ use artificial intelligence to drop prices as goods come towards the end of their shelf life.

Managing food storage

Items at highest risk of being thrown out are those that spoil quickly, and these tend to be stored in a refrigerator. Intelligent fridges and fridge cameras, often linked to mobile phone apps are technologies that may help people manage food more effectively. Intelligent fridges track items stored in the fridge along with expiry dates and generate shopping lists. Domestic refrigerators with an inside camera that store the location of items within the fridge are already commercially available, such as the Samsung Family Hub set of appliances³⁹.

Food sharing

Sharing food has been an integral part of social culture across the world for millennia, but sharing food with strangers for the purposes of reducing food waste is something new. This has largely been enabled by social media and mobile phone technology, which is good at putting people in touch with one another. Services such as OLIO⁴⁰ aim to reduce food waste at the level of the consumer (both domestic and institutional, e.g. restaurants) and at the level of retailers. Others, specifically target the hospitality industry (e.g. Too good to go⁴¹), and are commonly linked with individuals ('heroes') who distribute food, and with food banks that distribute food to the food poor.

Food sharing apps are now among the most commonly used apps in the food waste reduction area (van der Haar et al.⁴²). However, the donating and receiving of foods is linked to a range of complex issues. For example, donors may fear exposing their poor cooking ability, they may have concerns about the quality of their food, and fear the risk of making a recipient ill. Similarly, recipients may have concerns about the safety of food, about which they know nothing, so food sharing is not socially acceptable yet (Schanes et al., 2018). Note that social norms are likely to be different in developing countries, and that trust may be able to overcome these issues (e.g. people get accustomed to using a system, or they build personal relationships).

³⁸ <https://www.wasteless.com/>

³⁹ <https://news.samsung.com/global/interview-designing-a-smart-refrigerator-for-european-tastes>

⁴⁰ <https://olioex.com/>

⁴¹ <https://toogoodtogo.com/en-us>

⁴² <https://edepot.wur.nl/519161>



Mobile phone apps

Despite the rapid growth in food waste apps, which appear promising and can combine multiple intervention types, there is as yet little literature addressing the effectiveness of these – another example of how the academic community needs to catch up with consumers and pressure groups. Therefore, it appears to be too early to comment on how effective they may be. Mobile apps fall into a number of categories:

- Informative;
- Reminder e.g. BinCam;
- Food sharing;
- Food and Shopping management (planning purchases);
- Storing (keeping track of food);
- Recipe sharing & advice;
- Supermarket apps e.g. business data to inform users of cheaper foods.

Adoption of apps is a problem because even though people may hold negative attitudes towards food waste, they don't believe that they waste food, so motivation is weak (van der Haar et al.⁴³).

7.5.4 Implications of reducing food waste

If it can be assumed that some kind of technical intervention will be required in order to reduce household food waste (such as a refrigerator), then this will result in a shift in expenditure patterns. For example, more money spent on a fridge and less money spent on food (and fuel). Any significant drop in demand for food will cause prices to drop, which will have a negative impact on producers – likely to be local farmers in markets with a short value chain (as is common LMICs). If the money saved on food exceeds the additional expenditure on in intervention, then the household will need to decide where to spend that disposable income. If it remains within a food budget, then it could be spent on a greater variety of foods to improve dietary diversity, for example.

⁴³ <https://edepot.wur.nl/519161>

Waste is generally regarded as food intended for human consumption that is not eaten and thrown away. However, food thrown away is not necessarily wasted – it can be utilised as animal feed, compost, or biogas digestion, for example. Where food waste is utilised in this way, then any reduction in food waste will have a knock-on impact. This may require additional expenditure (e.g. animal feed), or result in a poorer service (e.g. reduced application of organic fertiliser).

In their review of literature on food loss and waste in Sub-Saharan Africa, Sheahan & Barrett (2017) raise the concept of optimal food loss. This is based on the premise that eliminating all loss and waste will be prohibitively expensive. It is also a function of technology, which is continually developing and varies between regions. In commercial parts of the food supply chain, one approach to determining optimal levels of loss are linked to profit maximisation. For example, farmers may store grains (and increase the proportion lost to pests) in order to realise better profits by selling when supplies at markets are low.

8 Food Policy

8.1 ‘Modernising’ Food Systems

From a policy perspective, the trends highlighted in this report are all features of a ‘modernising’ food system transition (Lawrence, 2017). While ‘traditional’ forms of food production, processing, procurement and retail are still dominant across MECS countries, changes in both food chains and consumer habits are changing as a result of mechanisation, trade liberalisation, rapid urbanisation, and public and private sector investment. Since the turn of the century, food policy itself has modernised, reflecting a change in focus:

“from agriculture to processed foods; from home to outside foods; from rural to urban; from micro-nutrient deficiencies to fats and sugars; from peasants to the urban poor; from food-based welfare relief schemes to income transfers.” (Lang, 2009)

It is therefore essential to understand the food policy landscape in MECS countries in order to identify existing priorities, challenges, and obstacles to further food system modernisation, which is likely to continue to reduce energy consumption in cooking at the household level.

In all parts of the world, modern food policy tends to suffer from a lack of coherence and coordination. No longer dominated by central agricultural ministries, modern food policy also falls under the remit of health, trade, business, and environmental policy-making institutions. National policy frameworks and enforcement protocols overlap with international guidance, regional compacts, private sector investment and regulations, and decentralised agencies. Not only can these different actors be responsible for different aspects of food policy, but these actors can have radically different priorities and objectives, relating to concerns over climate change, urbanisation, population growth, energy, healthcare, poverty, or land management.

In broad terms, the modernisation of food systems is enhanced by two forms of policy intervention at the national level:

- direct support for existing production and value-added processes, such as subsidies, social safety nets, and public procurement policies; and
- the creation of an ‘enabling environment’ (Matondi and Mutopo, 2011) to encourage private sector investment and entrepreneurship in the food industry, through policies that aim to improve transparency, provide incentives for investment, and expand and modernise infrastructure (Ibid.).

However, when it comes to explaining the drivers of modernisation in the food industries of MECS countries, national policy-making appears to be of secondary importance to broader socio-economic shifts, related to

demographics, urbanisation, and the liberalisation of international trade. Nevertheless, it remains necessary to understand the food policy contexts that affect the food system transitions in MECS countries, in order to identify areas of opportunity to contribute to modern energy transitions for households and along the food chain.

8.2 Food Policy in the Global Context

In recent years, the World Bank Group has published a series of reports titled *The Future of Food*, promoting comprehensive policy agendas for nutrition and health (2016), digital technologies (2019), financing (2018) and ‘climate-smart’ solutions (2015), among others. Each of these reports laments the severity and scale of global poverty, and promote the modernisation of food systems as a solution to this problem. Sub-Saharan Africa and South Asia, where the vast majority of MECS countries are located, are identified as experiencing acute problems relating to undernourishment, hunger, food contamination risk, accelerating poverty and insufficient incomes, low rates of mobile and internet connection, uneven agricultural investment and production shortfalls (Ibid.). However, it is also recognised that a ‘dietary transition’ is under way in many low-income countries, resulting in more diverse diets that include processed foods and “out-of-home consumption” (World Bank Group, 2018). In line with the trends outlined in this report, these policy briefs offer certain recommendations that provide potential opportunities for value-added enterprises operating in MECS countries:

- Promote the diversity of food production and consumption;
- Reduce energy and micronutrient deficiencies;
- Improved marketing information, infrastructure, and low tariffs and taxes;
- Investments in rural infrastructure, market linkages, cold markets, and other logistical services;
- Align farmer incentives to respond to changing market demands.

(World Bank Group, 2016).

In contrast, other recommendations suggest that the business environment for food companies – and particularly for ultra-processed food companies – may become more restrictive in the future. These reports also recommend policy-makers to:

- Improve food labelling;
- Restrict food and beverage advertising, especially to children;
- Limit specific dietary factors (such as trans fat);
- Reduce subsidy biases for processed foods;
- Reduce subsidy biases for foods high in salt, oil and sugar; and consider the use of taxes to influence consumer behaviour.

(World Bank Group, 2016).

While national governments often retain responsibility for food safety and regulation, international agendas and agreements can still significantly impact the business environment for localised food industries. On the subject of food safety, the export potential for developing countries can be significantly reduced if higher standards and better monitoring and enforcement are present in other countries (Josling, Orden and Roberts, 2010; FAO et al, 2020). Countries with higher standards also have an advantage in exporting their own processed products to countries without the same level of standards. The Sanitary and Phytosanitary Standards (SPS) is one means by which the WTO has sought to reduce disparities in food safety between countries, to promote trade and improve consumer health. SPS aims to create policy and regulatory harmonisation and to allow for disease-free region recognition by trading partners, but with limited success in terms of binding agreements between nations (Ibid.). SPS and its requirements for food standards are voluntary, and are made effective

through national legislation (WHO, 2018). Large food corporations often take it upon themselves to apply international standards throughout their global supply chains (e.g. the food safety system ‘Hazard Analysis and Critical Control Point’ (HACCP)), but may become hampered by inadequate public policies (Wallace, Sperber and Mortimore, 2011). In order to understand the food safety policy landscape in specific countries, it is necessary to understand both public and private regulatory practices. Whereas policy has tended to focus on export markets, attention is increasingly turning to domestic markets, with the added complexity that informal markets dominate the food landscape in MECS countries (Freidberg, 2004; AGRA, 2019).

While an emphasis on diet diversity and food affordability, accessibility and availability can help to promote food innovation and industrialisation in MECS countries, international organisations seem committed to helping these countries avoid the health and environmental risks associated with modernising food systems elsewhere. The 2030 Agenda for Sustainable Development Goals (SDGs) also embodies this perspective. Adopted in 2015 by all 193 countries represented at the United Nations General Assembly, the 2030 Agenda includes specific targets that will impact modernising food system transitions. For instance, SDG2 (“end hunger, achieve food security and improved nutrition and promote sustainable agriculture”, UN, 2015) includes targets around food production, safety, nutrition, security, innovation, investment and trade (see Appendix). The emphasis is placed on increasing agricultural production and productivity, but the entire value chain is implicated in terms of increasing the supply and affordability of raw materials, investments in infrastructure and technology, and maintaining favourable terms of international trade. It is important to also recognise that other SDGs, focusing on health and well-being (SDG3), access to modern energy (SDG7), inequality (SDG10), sustainable cities and communities (SDG11), and responsible consumption and production (SDG12), also have important implications for food policy. In the FAO Framework for the Urban Food Agenda (FAO, 2019), for instance, SDG11 provides the impetus for innovation in food system planning, agro-food business, urban-centred production, and reducing food waste in urban centres.

However, targets associated with the SDGs lack both precision - in terms of policy implementation and legislative frameworks - and enforcement mechanisms (Persson, Weitz and Nilsson, 2016). Targets are “*aspirational [...], with each government setting its own national targets [...] taking into account national circumstances*” (UN, 2015). For the purposes of this report, therefore, it is essential to understand how this global context is reflected in the implementation of food policy in specific MECS countries.

8.3 Food Policy in African MECS Countries

At the inter-governmental level, there has been a long-standing commitment to modernising agricultural policy in Africa, principally to increase food security and to improve the livelihoods of smallholders, who make up a significant percentage of the workforce in most African countries (Gollin, 2014). In 2001 the African Union established the New Partnership for Africa’s Development (NEPAD), which developed an action plan for land management, water control systems, infrastructure and research and technology transfers, through the Comprehensive African Agriculture Development Programme (CAADP), established in 2003. While CAADP compacts have been signed by each of the Regional Economic Committees (RECs) in Africa, these Pan-African frameworks crucially lack enforcement mechanisms, and are subject to implementation in individual countries (Deijl, Djurfeldt and Jirström, 2017). With an emphasis on increasing investments to boost production, productivity and market access, RECs have nevertheless been a vehicle for increasing intra-African trade, through free trade agreements, customs unions, common markets, and even economic and monetary unions (Pernechele, Balié and Ghins, 2018).

It is widely understood that the RECs with stronger cooperation structures (e.g. ECOWAS, EAC, SADC, COMESA) have had greater success in implementing food policy reforms in line with CAADP (e.g. Deijl, Djurfeldt and

Jirström, 2017), although success is also heavily curtailed by national implementation processes, protections on trade, and a lack of diversity in food production (Ibid.). In 2014 the Malabo Declaration updated the CAADP objectives, which now include targets to reduce post-harvest losses, triple intra-African trade, and enhance the resilience of livelihoods and production systems (DREA, 2019). With additional capabilities to monitor progress and implementation, food system modernisation has thus received greater institutional support at the regional level. In addition, international attention on food safety and quality standards in Africa has significantly increased in recent years, and particularly following the ratification of the SDGs in 2015 (Scura, 2019). Before then, safety concerns had largely been directed towards African exports, rather than production for domestic consumption (Global Food Safety Partnership, 2019). Enhanced transparency is intended to benefit the private sector as well as protect consumers, although the costs associated with these developments may prove less favourable to smaller businesses in the local food industry.

The increase in availability and affordability of processed foods on the African continent must be principally understood in part through international trade patterns and agreements. The European Union's Everything But Arms initiative (EBA) removes the majority of trade barriers between the EU and all MECS countries, but trade privileges are unevenly distributed in Africa as a result of EU-African Economic Partnership Agreements, among others. Free trade policies have had a positive impact on African exports (Gradeva and Martinez-Zarazoso, 2016) but at the detriment of the growth in food production diversity in these countries (Rakotoarisoa, lafrate and Paschali, 2011), impacting the market opportunity for value-added production. In addition, the EU enjoys a significant competitive advantage in the processed foods market relative to Sub-Saharan Africa, due to indirect forms of subsidisation (Goodison, 2007) and already-existing infrastructure that impacts the cost of production, distribution, and compliance. This competitive advantage is most significant among minimally processed foods – often the “starting point for agriculture-based industrial development” (Ibid.).

As all MECS countries in Africa are net importers of food, their exports markets are considered essential to economic growth and stability. As well as favourable trade relations, many African governments place agricultural subsidies at the centre of national food policies, as a means of increasing production and productivity. Malawi is praised for its success in using subsidies to increase production and improve food security. Targeting smallholders with coupons for improved seeds and fertilisers, Malawi achieved its highest ever surplus of maize in 2005-6, boosting exports but also halving food prices (Juma, 2015). Following this success, Malawi's Agriculture Development and Marketing Corporation have improved subsidy targeting and expanded to enhance private sector investment, irrigation investment, and post-harvest support for farmers (Ibid.). This pattern of policy progression in Malawi - beginning with a subsidy programme and developing an integrated, investment-orientated approach - has proved successful elsewhere in Africa. Nigeria's Agricultural Transformation Agenda (ATA) is a particularly noteworthy example, which delivered e-wallet subsidies rather than public procurement to simultaneously support producers and crackdown on corruption. Nigeria's Ministry of Agriculture and Rural Development also targeted the food processing industry, building rice mills with parboiling capacity and instigating a composite flour policy, which required millers to incorporate High Quality Cassava Flour (HQCF) into their manufacturing process. Staple Crop Processing Zones were also introduced, significantly improving the infrastructure of the national food system and de-risking agro-processing at the same time. This 'enabling environment' shifts agriculture from a development-orientated to a business-orientated sector (Juma, 2015). The Minister responsible for Nigeria's ATA is Akinwumi Adesina, the current president of the African Development Bank. The Bank is currently working to expand these reforms across the continent.

According to the 2019 Africa Agriculture Status Report, Sub-Saharan Africa is now undergoing a “quiet revolution” and an “emerging modern revolution” in food processing, distribution and retail (AGRA, 2019). While long-standing commitments to infrastructure upgrading, support for producers, and trade liberalisation have all played an enabling role in the emergence of private sector actors across the value chain, this 'revolution' is as

much a result of a substantial increase in demand for convenient, diverse food products, associated with rapidly growing urban populations (Ibid.). Importantly, much of this growth is in small and medium-sized enterprises, as larger enterprises tend to be concentrated in the trade sector (exports represent only 6% of agricultural output in Sub-Saharan Africa) (Ibid.). Throughout the report, the central policy message is for governments and donors to avoid “reinvent[ing] the wheel” (AGRA, 2019). Private sector dynamism has already landed in many African cities, and the role of policy should be to remove constraints that hold back SME growth in the food industry: inadequate market and road infrastructure, corruption, energy costs and vehicle import costs.

Evidence is emerging that the rise in availability of highly-processed foods is a cause for concern for consumers, anxious about food safety and foodborne disease (e.g. Ghana – Omari and Frempong, 2016). Civil Society Organisations, like Kenya’s Route to Food, are also pressuring governments to act to improve food safety as well as food security, and ensuring the majority of small and medium-sized food producers are not forced out by increasing supply costs and the competitiveness of larger domestic and foreign enterprises (Ndubai, 2019; Maingi, 2019). In Kenya, it is supermarkets that are driving food quality standards, adopting internationally-recognised practices (Karki, Fasse and Grote, 2016). Developing domestic food supply chains – including value-added processing – can help to shield countries from fluctuations in global food prices (Islam and Kieu, 2020). It is important that development-orientated interventions into processed foods are aware of these societal concerns and engage with food justice movements to ensure positive outcomes along the value chain.

8.4 Food Policy in Asian MECS Countries

As is the case in Sub-Saharan Africa, regional bodies have become important vehicles for food policy-making and planning in Asia, but enforcement mechanisms regarding implementation, regional cooperation and legal compliance remain limited (Islam and Kieu, 2020). Three of the four Asian MECS countries (Bangladesh, Nepal, Myanmar) are members of The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), first established in 1997 and aiming to overcome the failures of the South Asian Agreement for Regional Cooperation (SAARC), which was plagued by geopolitical tensions between India and Pakistan (Mohan, 2016). Cambodia remains outside of BIMSTEC, but may be affected by developments in regional cooperation between South and South-East Asia due to Thailand’s membership. While regional integration remains limited, the growth potentials and ongoing economic transitions of BIMSTEC countries provide significant opportunities for enhancing regional value chains, based on comparative advantages (Bari, 2018) – a development that would benefit food processing companies operating in the region. Decisions made among ASEAN member countries (including Myanmar and Cambodia) may further benefit Asian food industries. Free trade agreements between ASEAN countries and China (2005) and India (2010) have been complemented by the 2012 ASEAN Comprehensive Investment Agreement (Ajmani, Choudhary and Roy, 2019), although it is not clear whether these developments have enhanced or hindered the development of the smaller food industries in MECS countries, relative to their Chinese, Indian and Thai counterparts. Food safety has been high on the ASEAN agenda in recent years, culminating in a cohesive Food Policy Framework (The ASEAN Secretariat, 2016) developed in partnership with the European Union. However, small and medium-sized enterprises (SMEs) dominate the food industries in Asia, and the uptake of recent policies and regulations remain limited due to a lack of coordination and knowledge sharing (Lin, 2019).

In comparison to its African counterparts, the MECS countries in Asia enjoy greater food independence and thus greater food security at the aggregate level, although there are significant exceptions for those in poverty and in remote areas, and for those deeply impacted by natural disasters. Asia’s Green Revolutions in the second half of the 20th century is widely praised for improving food security, particularly through the intensification and expansion of cultivated land (de Koninck and Rousseau, 2013). As is the case in much of Africa over recent decades, public investments in agriculture, infrastructure and research were key drivers of increased production

and food security, although public investments in African countries have tended to be limited in comparison (Hazell, 2009).

In more recent years, new iterations of a green revolution have resurfaced in each of the four Asian MECS countries: Nepal, Bangladesh, Myanmar and Cambodia. In Nepal, intensification and cooperative farming are leading a ‘quiet revolution’ that seeks to improve rice production and reduce a dependence on Indian imports, brought about by limited land availability and significant labour migration (Awale, 2015). The enormous gains in rice production in Bangladesh (Headey and Hoddinott, 2016) are likely to be reversed by climate change in the coming decades (Lewis, 2019), and as a result the current policy focus is placed on “nutrition-sensitive investment” to increase diversification and resilience as well as production (FPMU, 2018). Similarly, food policy in Myanmar is moving away from its green revolution-era emphasis on yields and self-sufficiency, and towards an integrated policy agenda aiming to increase innovation and dynamism along the entire food value chain (NESAC, 2016). As in Bangladesh, past success in the production of key grain commodities in Myanmar has formed a solid foundation upon which new policy initiatives can assist in the growth of the private sector along the food value chain (Belton et al, 2015). Finally, in Cambodia, Green Revolution technology can still have an impact on agricultural production, which has previously been held back by conflict and multiple droughts (Otsuka and Yamano, 2005; UNDP, 2013). In its National Strategy for Food Security and Nutrition (NSFSN) 2014-2018, Cambodia echoes its neighbours by stressing the importance of diversification, intensification, and sustainability, as well as growing the SME sector by improving access to technology, credit and markets (Council for Agricultural and Rural Development, 2014).

Green Revolution-style spending on agriculture and infrastructure – relative to Sub-Saharan Africa – has made many Asian countries key recipients for Foreign Direct Investment (FDI). In Bangladesh, FDI increased 32% between January-November 2018, and was projected to increase an additional 32% in 2019 (Euromonitor International, 2019). As a result of these trends, many countries in Asia have experienced a rapid rise in food industry Transnational Corporations (TNCs) (Soon and Tee, 2014). The presence of TNCs has in turn fuelled an increase in the domestic supply of processed foods, with local firms taking advantage of low production costs and good infrastructure to compete against major brands (Traill, 2017). The growth in FDI has also been particularly pronounced in Myanmar, following major policy reforms beginning in 2010 orientated towards democratic accountability and foreign investment (Fielder and Iafrate, 2016). However, the increasing role played by private actors in South and South-East Asia is increasingly a developmental concern. TNCs rather than national governments are increasingly responsible for land development and agricultural expansion, while commercial crops for export are prioritised over food crops for domestic consumption (de Koninck and Rousseau, 2013). Landless labourers have increased relative to smallholders, and anti-poverty agendas are giving way to profit motives and growth targets (Ibid.). Of the four MECS countries in Asia, Cambodia appears to be the most at risk in these respects.

8.5 Food Policy and Covid-19

Food policy debates in the first half of 2020 have centred around the impact of COVID-19 (and national response measures to the crisis) on the production, processing, distribution, trading and purchasing of food. In MECS countries and elsewhere, national governments have taken immediate steps to limit the impact of the pandemic to support producers and ensure maximum food security. Meanwhile, international agencies are monitoring developments across national and regional food systems, alerting policy-makers to key vulnerabilities, and beginning to formulate policy agendas for the post-COVID-19 era. While the immediate policy focus centres on health concerns and the rise in global poverty (and thus food insecurity), energy usage has yet to form part of this conversation. This section analyses how the crisis is changing the policy landscape in MECS countries, in order to help identify emerging opportunities and challenges for food systems undergoing modernisation.

Initial reporting suggests that the pandemic is exacerbating existing weaknesses in food systems throughout the world (FAO, 2020b; The World Bank, 2020). A particular cause for concern is the potential for significant supply shocks, resulting from the pandemic's impact on labour, transportation, trade, logistics and distribution (FAO, 2020a). In addition, government-enforced restrictions on movement and business operations have severely impacted household incomes and thus the affordability, as well as the availability and accessibility, of food. Rapid assessments in Bangladesh have revealed a significant increase in food insecurity not only because of a widespread reduction in incomes, but also due to the closure of small businesses and street vendors, limitations in the distribution of food aid, and inadequate social safety nets (Rahman and Rusczyk, 2020). However, the availability of cheap, processed foods seem to have offered an alternative to the need to skip meals outright, even if it means consuming calories with little nutritional value. In fact, an increase in global consumer demand for non-perishable goods seems to have highlighted an opportunity for expanding localised food processing capacities (FAO, 2020e).

To ease the impact of lockdowns, agriculture and food have been almost universally recognised as “essential” sectors, allowing for greater movement of people and goods in order to limit the disruption to food production, transportation, and trade (The World Bank, 2020). Member countries of ASEAN have collectively committed to “open trade, regional cooperation, food security, resiliency and sustainability of regional supply chains, especially for food” (FAO, 2020d). However, the FAO has also reported significant challenges across the food supply chain in African and Asian countries; disruptions to transportation and public procurement have led to increases in post-harvest losses, a lack of supply of raw materials for processing and value-added enterprises, and difficulties moving food from rural to urban areas, as well as from large urban centres to smaller towns (FAO, 2020b). Agri-businesses with integrated production systems have a far greater chance of continuing their operations in spite of these challenges and the widespread restrictions on public transport and food markets (Ibid.). Smallholders have been the hardest hit (Torero, 2020), and the full impact on Africa's ‘quiet revolution’ in food remains to be seen.

China's industrialised food system and interventionist policies have proved successful in limiting the impact of enforced lockdowns. Online food markets, surplus production, a food reserve system, local self-sufficiency targets, and the much coveted ‘Vegetable Basket Programme’ have all contributed to successfully meeting the demand for food and adapting to changes in food purchasing habits during the pandemic (Si, 2020). Especially relevant to the question of modern eating is the emphasis the Chinese authorities have placed on urban food system planning, including farmland protections in townships in close proximity to large urban centres, and an extensive network of diverse food outlets in these urban centres (Ibid.). In countries with modernising food systems, it will be necessary to develop urban-centred solutions to existing food supply chain weaknesses.

The familiar mantra of “don't let a good crisis go to waste” is applicable to current food policy debates, as countries transition from crisis mitigation to considering ways of enhancing food system resilience. In relation to the fisheries and aquaculture sectors, the FAO assert that “the pandemic can serve as a catalyst for the introduction, wider promotion, and faster adoption of plans and programmes to make the sector innovative, and socially and environmentally responsible” (FAO, 2020c). It is important to consider policy recommendations and their implications for food processing and modern eating:

1. Improve food safety practices at each stage of the supply chain, and particularly in countries where informal markets dominate the food landscape (FAO, 2020b).
2. Encourage “multi-stakeholder investment” (FAO, 2020c), enhancing links and networks along the value chain and empowering producers and value-added enterprises through the formation of professional associations.
3. Greater public investment to a) de-risk private investment, b) increase production and productivity through the provision of subsidised agricultural inputs c) improve market- and trade-related

infrastructure, including establishing and developing agro-processing zones, and d) promote regional value chains (FAO, 2020a; Torero, 2020).

4. Avoid import and export restrictions and continue regional economic integration policies, in order to prevent a sharp rise in food prices (Torero, 2020).

In many respects, these policy objectives have been in place long before the pandemic began, and have contributed to the modernisation of food systems in Africa and Asia. It remains to be seen whether proactive government interventions – such as the Sustainable Agricultural Intensification and Food Security Project in Rwanda, and the \$96m Emergency Action Plan in Bangladesh (The World Bank, 2020) – are able to create additional opportunities for the food industry, or whether these measures are unable to return national food systems to pre-COVID activity levels. This question also applies to the countries affected by the Locust Crisis; in recent months Ethiopia, Kenya and Uganda have received international grants targeted towards food production and infrastructure (Ibid.). However, these crises have only increased the incentive among policy-makers and international agencies to modernise food systems, developing further opportunities for pre-cooked, processed, and ‘modern’ food solutions across the MECS countries.

9 Cultural Representations of Cooking

9.1 A brief overview of food and culture studies

When we think of cooking, what subconsciously springs to mind is the standard dictionary definition: the preparation of food through means of heating. However, the art of cooking is essentially the act of food distribution (or redistribution) embedded within socio-cultural forms (Symons 2002). The cooking pot is symbolic of the external pre-digestive, artificial stomach of the household (Watson 1971), whilst the practice of cooking itself has had social implications of “increasing human adaptability to habitats and [enabling] entire modes of production” (Symons 2000: 13).

Although food has been a topic of anthropological/sociological analysis for decades, it has quite often been positioned as a symbolic or material marker for the dichotomies that exist within society. De Beauvoir (1947) used food and cooking to draw attention to the gendered domains that exist within households (and society at large) which place men in the sphere of transcendence and women in the sphere of immanence. For Lévi-Strauss (1970), the distinction between raw and cooked is representative of the distinction between nature and culture: to cook one’s food is to transition from nature to culture, in other words, to cook one’s food is to acquire culture, *to become cultured*. Not deviating far from Lévi-Strauss, Bourdieu (1984) asserted that taste and food choices are a result of class habitus – that working classes are interested in substantial and hearty meals that are filling, whilst the bourgeoisie (middle classes) favour meals that are more intricate, refined and unusual (this in turn becoming the basis for his argument that cultural capital and tastes of the middle classes are often viewed as the ‘desired taste’ or aesthetic of a society). Supporting this, Charles and Kerr add that food produces (and reproduces) “family and patriarchal familial ideology” (1988: 1-2).

An important intercession in studies of the relationship between food and culture came in the form of Goody’s (1982) work on the emergence of world cuisine in localized contexts, specifically in postcolonial Ghana. Goody’s research indicated a ‘turn’ in the study of culture and food by putting forward arguments that food is deeply embedded within questions of power, class and (in)equality, and in turn spurred studies on the globalization of food.

By and large, existing literature posits that cooking:

- Enhances nutrition;

- Provides pleasure;
- Reinforces culture;
- Defines social positions, food production and economies.

(Symons 2002)

In the 1940s, anthropologist White began to look at the way in which culture and energy are interlinked, stating in a paper in 1943 that the purpose of culture was to meet man's needs, both internal and external. Whilst the internal needs pertain to those drawn from individuals themselves (spiritual or aesthetic needs), the external needs are linked to humans drawing from the world around them in order to meet the most basic need: to feed oneself. The internal can only be met once the external has been satisfied. Drawing on this, White went on to make the association between culture, food, and energy and put forward that the *law of cultural evolution* was embedded within energy: "culture develops when the amount of energy harnessed by man per capita per [unit of time] is increased; or as the efficiency of the technological means of putting this energy to work is increased" (1943: 338) or, in other words, culture changes as we adapt our use of energy. White's work supports that of Robert Millikan, the Nobel prize-winning physicist, who claimed that rapid changes in society is down to "discovery and utilization of the means by which heat energy can be made to do man's work for him" (cited in White 1943: 356). What White does is to trace the development of culture not to humanity's use of energy through industrial and technological examples, but rather to do so through the linking of food to energy expended: that our food systems changed over time in relation to the energy put in. From the wild food economy, where the energy from was the hunter-gather, to a pastoral economy, where fire was used to transform raw meat into cooked, to the agricultural economy, where man is able to manipulate energy to yield more produce. Most notably, White states that "agriculture transformed a roaming population into a sedentary one". We moved from nomadic lifestyles to more settled ones, and in turn moved ironically further away from the tasks of 'food gathering'.

If energy is central in understanding the trajectory of culture's development, and culture itself both serves our needs for food, and is grounded on our ability to transform our food (from raw to cooked), then it goes without saying that cultural adaptations around food and cooking needs to be considered within the context of energy and fuel transformations.

Whilst within energy studies – especially in literature addressing climate change and sustainable energy transitions – White's work is well-known and highly regarded, his linking of our food systems, cultural development and energy choices has largely been forgotten. There seems to be a significant gap in food literature in seeking a deeper analysis of the actual *practice of cooking* and how cooking is shaped by shifts in food availability, globalization, and transformations in energy availability and reliability, specifically within the MECS countries. This is supported by Symons (2002) claim that, despite being an essential part of human life, the practice of cooking itself remains surprisingly under researched.

9.2 Bond formation and belonging

Research has shown that strong social bonds are created and established through the sharing of food – whether this be in the form of a shared meal, or through systems of food bartering/exchange – and tacitly organises social lives by organising times in which individuals come together, drawing strong social lines of inclusion and exclusion (through who is included, or not, in the partaking of a meal) and establishes rituals and rules of etiquette (Simmel 1910). Similarly, good fellowship and community is established or delivered via food sharing/exchange – either in the form of gifts of food, bartering of goods or the sharing of meals (Douglas 1984).

Meigs (1987) found that for the Hua, of Papua New Guinea, food is inseparable from who cultivated it, and the relationship between cultivator and consumer. Food has a “transmittable vitality, essence, nu of their human producers...alive with the feelings, the emotional intents, of their producers” (Ibid: 104), whilst Landecker (2011: 187) states that food is more than a symbol of who we are at present, but also links us to our history and ancestry: “we are what we eat – but also what our parents and grandparents ate”.

Food, as a collective aspect, further marks as our inclusion and exclusion in social structures. The partaking of meals might mark our entry into a community, or reinforce our belonging to a religious group, but equally marks our exclusion from such social institutions through a lack of participation. Food becomes a means for cultural exchange both anchoring us within our culture when we are ‘at home’, and evoking memories of who we are and where we come from when we’re ‘away’ thus acting as “the bridge to what is dear to us and our homeland” especially through taste (Barilla Center report n.d: 18)

If eating is both an historical, as Landecker (2011) implies, and contemporary way of relating (Bertoni 2013) compressing the memory, space and time through networks of both production and consumption, then cooking surely falls within the same category of relation. An argument can be made for a link between cooking and identity itself. We are products of what we eat, and what our ancestors ate, but we model our ways of eating and cooking are deeply embedded in longer trajectories of who we are and where we came from.

“The so-called adjunct values of food, i.e., all those meanings found in food that are not mere nourishment, are actually capable of bringing out the identity of a person or group” and reinforcing status, hierarchy, power, prestige, and division of gendered labour (Ibid: 17).

9.3 Gendered shifts in the food sector

The expansion of Africa’s food industry, as discussed in earlier sections, also brings with it an expansion or shift in the types of roles that women have in relation to food. De Beauvoir used food and cooking to draw attention to the gendered domains that exist within households (and society at large). According to de Beauvoir, men are responsible for the active, future-orientated roles associated with the concept of transcendence, whilst women are relegated and expected to maintain, or keep, the family and household intact, acts of immanence. Despite the increasing move of women into the workplace, the domestic space largely remains within their scope, thus leaving women to straddle both spheres of transcendence and immanence. Joynt (2008) points out that in research she conducted in the informal settlement of Pimville (in Soweto, South Africa), that although caregiving in households remain within the traditional gendered confines, and decisions around food purchases, cooking of food and distribution of food remain with women, what is increasingly observed is that decision-making around cooking appliances and cooking fuels is shifting from being male-orientated to either combined or female-led as women become house-hold income contributors.

Pre-Covid-19, the food industry held great potential for expansion in Africa, increasingly seeing the emergence of local female entrepreneurs, specifically in the MECS priority countries of Tanzania, Ethiopia and Zambia. Highlighted below are three prominent businesswomen who have entered the food sector and have been put forward as icons to inspire African entrepreneurs, especially African women, “to thrive for their success and prove they can add value to the society as well as the nation” (Rinchi 2019:n.p):

1. Jennifer Bash started Alaska Tanzania Industries in 2016 after realising that not many businesses were interested in processing local food products into consumer goods. Alaska Tanzania Industries largely process, package and distribute locally-produced goods to local supermarkets and international retailers such as Food Lover’s Market.

2. Monica Musonda, of Zambia, previously worked at Dangote Group under Nigerian businessman Aliko Dangote. Inspired by his success, and building on how few Zambian entrepreneurs were taking up opportunities, Musonda established Java Foods which, according to the company's website, aims to provide high quality nutritious instant foods made from local products (like cereals and noodles) to consumers at affordable prices.
3. Tseday Asrat moved into the food sector after she lost her clothing boutique as a result of city planning and expansion. Having previously been a fashion entrepreneur, and inspired by popular coffee chains, Asrat shifted her entrepreneurial knowledge and passion into the coffee industry to start up Kaldi's Coffee café, which has seen great success.

9.4 Cooking – still the women's role?

On the one hand, research on culture and food seems to be centred on the meal as the form of exchange and organisation, whilst studies outside the domain of the social sciences focus on nutrition. Catharine Beecher (Beecher cited in Barilla Center report n.d: 15) stated in 1872 that “the unhealthiest foods are those resulting from poor cooking, such as heavy, sour bread, sweets, pastry, and other dishes based on cooked mixtures of flour and fats. The fewer the mixtures in the kitchen, the healthier the food”, with the implication that good and healthy food is dependent on a mastery of the technical cooking skills.

However, with globalization and the movement of women into the workforce, we have observed a shift from home cooking to fast or processed foods and to eating out. Beyond limitations of time and efficiency, individuals are jointly driven by a desire for ‘the experience’ of a more Westernised lifestyle (Barilla Center report n.d), and the ‘break’ from following the regular rules of conduct – often formal and gendered – that are associated with domestic kitchens and dining rooms. Individuals are able to eat with members of the opposite sex, use their hands, try new dishes, and overlook the regular rituals and codes of etiquette that would be enforced at home (Ibid; Kifleyesus 2007).

Parasecoli (2005) points out that when food is advertised in media targeting men, it is almost exclusively fast food or processed/ready-made food, thus reinforcing the heteronormative or patriarchal view that the cooking is a woman's domain. When it comes to the preparation of food, men are expected to do so in ways that will not bring into question their masculinity, and when engage in acts of food preparation, it is expected that the most they will do is to ‘assemble’ dishes which will not only save time but will spare their ego (Ibid). The only exception to this, usually, is the association of men and meat where cooking meat is cross-culturally entrenched as being ‘a man's job’ (Ibid). The roles of men are to consume, whilst women are delegated to roles of provision and nourishment.

The role of the woman at the cook pot – and in the eating order – is easily reduced to subservience, Kifleyesus (2007) points out that this is in fact a powerful domestic role: it is the *woman* who decides the serving order, and controls quantity/quality, tacitly emphasising the social hierarchies and inequalities of those sharing a meal. Whilst we might be left assuming that these gendered divisions are changing, a cursory glance at a Kenyan cooking group [name not included on privacy basis] on Facebook shows that the expectations of men being not only unskilled but ‘out of place’ in the kitchen is reinforced – surprisingly most often by women. A simple post on the group, accompanied by an image of a meal, showed women boasting about her partner's cooking:

“I came home to my man who cooked this dish for me.”

Whilst some commentators were supportive of the post, it is notable that a large number were also critical of the implication that men would or should be cooking, or that such a man was a “mythical” being. Several female contributors to the group made comments suggesting that they would not allow a man to serve them after he'd

been working all day, and that the role of feeding a partner was a woman's. Several other women asked, in varying forms, where they themselves could find such a skilled and modern man.

The implication in such posts is that, in supporting de Beauvoir above, that societal expectation is that men still operate outside of the domain of the kitchen, and that cooking is not seen as a creative role that falls within the sphere of transcendence. However, this then begs the question: if an increasing number of young women are moving into the work space, then who is cooking at home? And how are they learning to cook?

9.5 Transference of cooking skills

Sutton (2006), through ethnographies of cooking, critiques existing literature and studies which focus on food and cooking as purely symbolic, rather than as active processes. In asking us to push behind the concept of 'food as identity', he questions how individuals might face cooking as they simultaneously face conditions of modernity. Whilst studies on food on one hand focus on production and distribution, and on the other describe a multitude of diverse consumption practices (rituals in consumption), he points to the gaps left in not looking at specifically at cooking practices: "the products of cooking partake in some sense of both production and consumption, and nearly simultaneously" (Ibid: 300). Sutton argues that by examining cooking practices as skill-based ethnographies, we are push "to examine the complex processes by which practices are produced and reproduced, rather than positing vague forces of 'the global' and 'the local'" (Ibid).

Building on Levi Strauss' argument that the act of cooking is the signifier for the "transition between nature and culture" (1970), Brownlie, Hewer & Horne (2005: 7) put forward that cookbooks are themselves cultural products, or "artefacts of cultural life in the making". A commodification of culinary culture exists, which we've already seen in the culture of celebrity chefs across the Global North. However, when examining cooking practices and the transference of cooking techniques, how different are the bloggers/influencers across MECS countries who share recipes on social media platforms such as YouTube, FaceBook and Instagram, from the celebrity chefs of the US and Europe?

In the same Kenyan cooking group on Facebook mentioned above, Lizzie* posted a question:

"Why don't we take cooking classes? Like if you [are a] woman/man intending to settle down (either in marriage or alone?) Isn't this something we [should] consider??"

"Lizzie" (August 2020)

Of the over 70 comments on the post, the large majority were supportive of Lizzie's question and this ultimately led to a discussion on where and how one 'could learn to cook', with some members expressing frustration at not having found formal cooking classes. Whilst a few group members offered their services (including Lizzie herself!) in the form of small group cooking lessons - either in person or via online - several made reference to the learning via social media. "Cooking can be self-taught too. If you aren't able to take classes, YouTube can be of great help," and "Kuna yu tube shannols. Just install wifi and you are good to go," wrote two users.

What is of interest here is that, as Lizzie pointed out in her comments, "[T]hat's also classes or learning; we are on the same page..." People tend to not view cooking as instructional when it's self-taught and outside of the traditional setting of mother-daughter narrative (or older/younger woman) or outside of the formal setting of kitchen-classroom. Food consumers, and likewise producers, have power in the "circuits of culinary culture" (Symons 2002: 434; Cook & Crang 1996).

There seems to be a gap in the literature showing a deeper analysis of the actual *practice of cooking* and how this is shaped by shifts in food availability, globalization, and transformations in energy availability and reliability. This is supported by Symons' (2002) claim that, despite being an essential part of human life, the practice of cooking itself remains surprisingly under researched.

9.6 Impact of Covid-19 and Climate Change on Informal Food Sector

9.6.1 Covid-19

A predicted 270 million people worldwide will face food insecurity by the end of this year according to the UN World Food Programme as a result of Covid-19. The secondary effects of the pandemic have resulted in the loss of jobs and rapid reduction in or complete loss of monthly income for many households as a result of the economic shutdowns lockdown brought about. This has meant that families living on the margins, or relying on daily incomes to feed those living in the household, have had fewer meals each day, reduced portion sizes or have substituted nutritious foods with foods that are cheaper on calories, the latter already being an issue in some parts of the world (Rahman & Ruszczyk 2020). Some areas are at further risk due to climatic factors which in turn impact on food availability. One such example is Mongla in Bangladesh. According to research conducted by Rahman and Ruszczyk (2020), the prices of goods increased substantially during the lockdown period due to a combination of restrictions on economic activities and also the inability to grow food in areas around Mongla city due to high salinity. Additionally, rumours of the virus spreading through food items, specifically animal products, have been detrimental to producers. According to the study, the poultry sector has especially been hard hit.

The issues mentioned above are not unique to Mongla. Food prices spikes, rumours around the ability to contract Covid-19 via food, and the inability to produce food are symptomatic of other countries. A European Commission report (2002) recently found that Covid-19 could push those in the top hungriest countries into further distress, of which Ethiopia and Nigeria are MECS countries of interest. It is a misconception that it is only individuals living on the margins that will be affected. Whilst they are certainly at a higher risk of developing severe cases of Covid-19 as a result of existing medical conditions associated with malnutrition and/or acute hunger and being further marginalised as food shortages arises, studies have found that there are pockets of middle-class urban households increasingly at risk as their livelihoods are compromised.

9.6.2 Changes to vendor practices

The implications of the Covid-19 pandemic is not only on food security. A report in May 2020 by KRC Uganda spoke of the impact that lockdown has had on food vending in Fort Portal, Uganda, where "food vending is a lifeline for over 28,000 people daily, mostly low-income earners who buy their meals prepared by food vendors because they find it affordable, easily accessible and available" (food vendors operated well until after midnight prior to the pandemic).

Food vending is a largely informal arrangement seen across many parts of the Global South and is an integral part of the food culture in society, providing an income and degree of financial independence (ability to buy small plots of land, build houses, pay school fees, pay off loans) to many households, and providing an affordable hot meal to those in urban areas who either have no time to cook, or lack the facilities or a place to cook, to vendors and consumers respectively (Ibid). With the outbreak of Covid-19 and subsequent lockdowns and curfews, once bustling streets have suddenly turned eerily quiet. Those unable to sell, have had to watch their goods rot, whilst others have violated lockdown regulations to trade illicitly although they have fewer customers. Thus, most vendors have been forced to dig into their savings and use their limited capital to tide them by over the lockdown periods. In Uganda specifically, food vending is a largely gendered economic activity

(KRC Uganda 2020) with around 80% (3 in 5) of the street vendors in Fort Portal being single mothers and the remaining 20% classified as youth. Additionally, many of the vendors are not local to Fort Portal, and are migrant workers in the town. Thus, the burden of the shutdown largely falls on the shoulders of female-headed households with little support in the community. This has resulted in a change in both eating patterns and change in business practice. The study observed that the food vendors would combine breakfast and lunch (usually porridge) but still eat an evening meal, thus reducing their daily intake. Further, vendors felt compelled to alter their approach to business by moving from selling *cooked* food to *fresh* (i.e. *raw*) foods. This move in itself is not as simple as it seems as “these are new businesses and the vendors [are] still learning how they work. Food vendors who have changed business said that they were making losses but had no choice but to try and find means of getting food for their households and children” or to work on farms as casual labourers (Ibid: 21). Additionally, the lockdown has seen the emergence of new food actors within the informal food sector in the town: the space once occupied by food vendors has now made way for milk vendors as a directive from the government has stated that milk production and sale is to be considered an essential service.

9.6.3 Climate Change changes food practices

As briefly touched on in the example of Mongla above, where high salinity in areas surrounding towns makes future crop growth difficult, Chen (2018) conducted research in Bangladesh which found that the eastern border region has been deeply affected by climate change, with increasing sea levels causing the inland to flood, not only contaminating water supplies but changing the salinity of the soil. Significant changes in crop quality, or total loss of crops are the trigger for many coastal farming families to migrate to larger towns or cities (Chen 2018; Lustgarten 2020). The consequences of this migration are not only about a remapping of global population, but there is the added “double burden” (Chen 2018): local families are displaced and, on the national scale, crop yield is affected as farmers face challenges in growing produce in new regions. Beyond the associated issues of food scarcity and resulting increases in the need for food importation as farmers are no longer able to grow their own food (Lustgarten 2020), for those who have managed to acquire land, crops do not respond in the same way to new soil. Barnaby et al (2020) found that increasing CO₂ levels also affect the crops – not only in terms of nutritional value, but also the quality of the produce. Whilst the connection to how this affects the preparation of food isn’t immediately recognised, this in fact does impact on cooking practices. When crops grow in warmer temperatures, or in different soil, or in areas with higher levels of CO₂, the cellular structure of the resultant produce alters. The consequence is two-fold: (1) cooking of food becomes more difficult; and (2) foods are less tasty and lack the same nutritional value they once did, thus affecting purchase value and resulting in individuals altering their choices as to what to cook and serve.

What is of importance here is the unseen impact on cooking practices. Thus, as environmental changes impact on how food is grown and alters the variety of modified foods entering the food chains, this means that the way in which people cook conventional, or ‘everyday’, dishes will need to adapt.

10 Expert Interviews

Having collated and reviewed the wide-ranging literature on ‘modern foods’, encompassing the nutrition transition and modernising food systems, the food processing industry, and changing consumer habits, this study has sought the expertise of a number of individuals working and operating at the forefront of food system transitions in MECS countries. Semi-structured interviews were held remotely with food innovation specialists, academics and practitioners, with a focus on the changes taking place in Sub-Saharan African countries. This section of the report provides a detailed overview and analysis of these discussions, placing emphasis on the issues that are of most relevance to the MECS programme’s objectives.

10.1 Covid-19

The interviewees currently residing in Sub-Saharan African countries were able to give clear insights into how the ongoing pandemic is disrupting food systems in significant and potentially irreversible ways. Travel restrictions and border closures have exacerbated the differences in food systems across neighbouring countries. Kenya is traditionally a large importer of raw foods from Uganda and Tanzania, but its large food processing industry has been forced to increasingly rely on local producers – an enforced process of localisation that has significant emotional and cultural value, which may be here to stay. For Uganda and Tanzania, their relative self-sufficiency has enhanced local food security, and the development of their own food processing sectors may prove valuable in mitigating against future disruptions to regional trade. The localisation of production in Kenya has seen smallholders fill the demand for produce, and it is believed that the beneficiaries of this, as well as those that have suffered by the sudden and severe changes, are reluctant to return to pre-Covid ‘business-as-usual’. The increasing precarity among the urban poor – particularly those who have been out of work during the pandemic - has led to a reduction in diet diversity, with consumption habits being determined by foods that are available, affordable, and - due to energy costs – do not need to be cooked in the home (e.g. chapattis). Some governments (e.g. Nigeria) have reduced the cost of electricity in recent months due to the pandemic, but it is not clear what impact this is having on cooking, and energy use more broadly.

Simply and locally produced foods could help provide cheap yet nutritious alternatives to boost diet diversity, but this requires the right kinds of production processes and distribution arrangements to be in place. It remains to be seen whether larger food companies, who have benefited enormously from trade liberalisation and expansive food supply chains, will buy into localisation in the long-term. Localisation is currently high on the agenda, and will arguably become more important in future years. However, while this remains uncertain, SMEs are attempting to take advantage of the opportunity, meeting local demand, institutionalising their production, processing, and distribution arrangements, and building local support for sustainable, localised food systems. It is important to remember that many SMEs have struggled to survive during the pandemic. There are reports that 40% of small food businesses have ceased operations either temporarily or permanently, and it is impossible to tell what will happen in the coming months.

10.2 Trends Associated with Modernising Food Systems

In line with the findings of this landscape study, the experts emphasised that convenience is a vitally important factor in changing food habits among consumers. Countries are urbanising, men and women are working long hours, and the time to cook using raw ingredients is evaporating for many households. Snacking seems to be an important growth area in African food industries, ranging from simply processed foods to ultra-processed foods, allowing people to consume food in offices or on-the-go. Up-take can be slow, however, due to a lack of familiarity with these new products (compared to both home-cooked versions and highly marketed, internationally branded food).

Changes to food systems are extremely complicated, for they take place at every stage of the food chain. It is therefore necessary for future research agendas to take a holistic view of the food industry, being wary of the energy implications of changes to producing, processing, distribution, purchasing, cooking, and consuming. This ‘ecosystem’ approach will help the MECS programme identify a wider range of opportunities to facilitate modern energy transitions across the food sector, and pay close attention to the specific dynamics taking place in each individual country and region.

10.3 Innovation

Product development is a major area of innovation in the food industry, as research institutions and businesses are responding to two recognisable trends: 1) greater demand for convenient, quick-cook or no-cook foods, and 2) greater global demand for ‘alternative’ foods: certain grains, legumes, and vegetables. Established companies in the ‘Fast-Moving Consumer Goods’ sector are well positioned to expand product ranges to meet the demand for convenient foods, without necessarily changing their business practices and routes to market. However, it is broadly recognised that the introduction of new products in this space can suffer from a slow-uptake, due to consumer scepticism. This is particularly true where the innovations are seeking to challenge or replicate foods of cultural significance, e.g. packaged versions of ugali. In terms of ‘alternative foods’, innovations are essential if actors are to overcome the lack of infrastructure that occurs throughout the supply chain. Alternative foods offer enormous potential in terms of reliable harvests, diet diversity, and a growing global demand for non-animal based proteins. Other than specific research institutions, it is entrepreneurs and smaller businesses that tend to operate in this space, and larger companies tend to follow once the market has become more established. These smaller enterprises therefore take on risk, but even basic processing machinery can help to make a product viable.

The demand for new, alternative foods is significant and growing, but the investment that would help with product development and bringing products to market can be lacking. In some cases, finance is available but many businesses are not ‘investment ready’. To have access to finance, it is essential for businesses to have audited financial accounts (20% of food SMEs are audited, as a rough approximation), and hold written records of business structures, performance, policies and governance. The development of networks and associations is helping to overcome this issue, ensuring that relevant information is widely available, and allowing for knowledge-sharing and networking across the industry.

Generally speaking, businesses that incorporated technology and innovation into their existing operations have fared better during the pandemic, as they have been better positioned to adapt to changes across the entire food system. E-commerce is a major area of innovation in food, enabling businesses to survive and people to get access to food under enforced lockdowns and restrictions on travel. WhatsApp has become a major platform for selling food, and many other apps have been launched to meet demand. These innovations may also help food businesses with marketing their products and advertising their brands, which has proved to be a challenge in the past. A lack of up-to-date, reliable data is also a barrier to innovation. Data that might inform business strategies is not readily available, and SMEs often have to rely on internationally-produced data and reporting that can be years out of date.

Food innovation does not necessarily have to constitute something new. Fermentation is a widely practiced food processing technique across the different MECS countries, and thus has cultural significance as well as being known to improve nutrition and have a long ‘shelf life’. Larger corporations have not been interested in fermentation besides beer and bread production, but China – as well as a number of smaller enterprises – are increasingly involved in fermentation processes for the commercial market. Although fermentation does not often require much energy, the process involves two main steps: 1) gelatinisation, or cooking, and 2) drying/roasting/dehydrating. As fermented products tend to be sold in informal markets, there is an increasing need for issues of quality assurance and food safety to be addressed. Switching production from manual processes to machine-orientated processes could help with standardisation and food safety.

10.4 Energy and Food

A common theme that emerged from the interviews was the lack of attention given to the energy implications of food-related interventions in Africa, which tend to be driven by: a) economic development; b) nutrition; or c)

sustainability. However, interviewees expressed there was significant potential for modern energy to contribute to each of these agendas. For instance, the mechanisation of food processing (and thus greater use of electricity) is crucial to increasing production levels, increasing the range in quality of foods that can be processed at any given time, and increasing food safety through more standardised practices. An energy focus can improve efficiency and competitiveness, thus helping businesses to scale up production.

Urban-based agricultural solutions, which are a major focal point of food innovation in high-income countries, are deemed an essential part of modern food systems and yet require high levels of energy input (light, temperature regulation). However, although electricity generation capacities are large and increasing in the majority of MECS countries, issues remain around the distribution of both the grid network and electricity meters, and this will need to be resolved if electrification is to make a significant impact on local food processing industries. As the MECS programme has already identified, past issues with the reliability and distribution of electricity has created a mind-set within communities that it cannot be relied upon, and therefore many food companies build this assumption into their business practices. Wood and charcoal are widely used, as are kerosene stoves and diesel-powered generators.

10.5 Nutrition and Health

Collectively, there was a sense among interviewees that MECS countries have the potential to modernise their food systems differently to Western countries, who became too reliant on ultra-processed foods and lost valuable local food ecosystems, causing enormous nutrition, health, and environmental issues. The profit motives of large multinational corporations mean that a better and more well-rounded modernisation process is difficult to achieve, and particularly while certain agricultural subsidies (e.g. on sugar cane) around the world remain in place. However, it is important to bear in mind that the nutritional value of 'processed foods' vary widely, and processing is often essential in making sure consumers have their nutritional needs met. Fortification is of paramount importance in MECS countries, where the consumption of animal-based proteins is relatively low.

It is widely recognised that diversifying food production to include a wider variety of grains, legumes and vegetables (cassava, sorghum, millet, bambara, baobab) will have positive effects on nutrition, sustainable development, local employment, and competitive advantage. However, these supply chains are significantly under-developed, and particularly compared to industrial-level production and processing of wheat, rice, and maize. In one sense, this provides an opportunity for the MECS programme, helping to scale-up the production of these less alternative foods through modern energy solutions.

But it is also argued that nutrition-led initiatives can be of limited value, particularly in ignoring or overlooking the nutritional value of some of the more widely-available processed foods. Breads, for example, when paired with a simple dish of beans or other legumes, can provide a healthy and nutritionally-balanced meal. Processed foods are also essential to meeting the nutritional needs of people who cannot cook – those without access to kitchens or hygienic/sanitary spaces, some elderly and disabled individuals, poor families who cannot afford the costs of home cooking, as well as those who do not like cooking or do not know how to cook. In these instances, processed foods and food retail are essential from a health and nutritional perspective.

10.6 Food Safety

Another aspect of food processing that enhances nutrition and health is in the area of food safety. Safety standards across Africa are relatively similar from a legal perspective, but the difficulties exist in the implementation and enforcement of these standards. Smaller companies may lack the capacity to meet safety

requirements, and this leads to a reduction in value when brought to market. Implementing practices that adhere to safety standards can be relatively straightforward, but significant upfront costs may be incurred in order to gain certification and to monitor these practices on an ongoing basis. Having a fragmented food processing industry consisting of many small operators can be a worry from a food safety perspective, given the logistical difficulties of monitoring and enforcing standards. In countries reliant on informal markets for the functioning of their food system, food safety concerns are a big problem. Facilitating mechanisation of food processing can be a part of the solution.

Striking the balance between food safety and enterprise can be difficult, as higher standards often require higher production costs. This year, Nigeria conducted a review into cassava standards, and slightly eased the requirements (in terms of bacterial count) in order to allow many more cassava processors to gain certification and sell their products, often to multinational corporations. The pressure to do so came largely from private interests, but there is evidence that the cassava industry is responding well to these small regulatory chains.

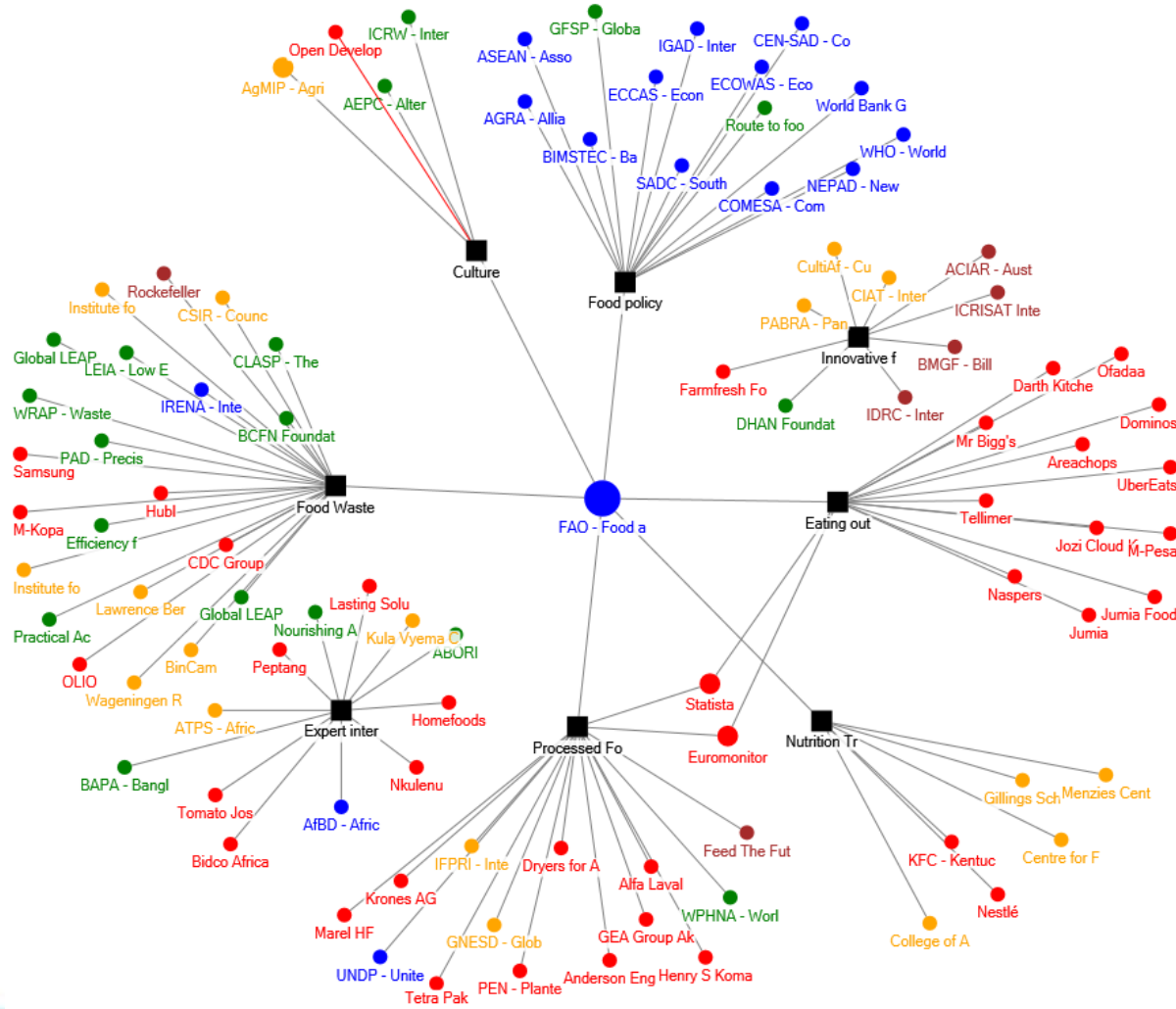
There is increasing consumer awareness of food safety issues, and particularly in relation to contamination risks. Awareness builds with every outbreak, but public bodies must also be recognised for their part in promoting better safety standards. In Nigeria, for instance, food safety is controlled by NAFDAC, who issues licenses upon inspection of businesses. Consumers know to look for the NAFDAC number on products as a sign that safe practices have been followed. That said, safety is probably a smaller consideration than affordability, given that many families are limited in what they can buy to feed their families.

In conclusion, these interviews shed significant light on the current state of the food industry in MECS countries, the various challenges facing SMEs operating along the food chain, and the impact of Covid-19 on the sector's future prospects. The interviews reaffirmed the trends identified elsewhere in this report around changing consumer habits and behaviours, and showed how market forces – rather than policy – are driving these changes. The interviews highlight specific areas in which the MECS programme could contribute to food system transitions, often emphasising the need to think about the nutritional implications of any proposed interventions. Finally, the interviews provided further evidence of a burgeoning field of local SMEs involved in the production and processing of food. Engaging with local enterprises and sector-wide networks will be important in identifying the areas in which a modern energy transition is not only feasible, but has the potential to make a significant and positive impact on the food and agriculture industry and the availability of convenient, affordable, nutritious foods.

11 Stakeholder mapping

The stakeholder mapping exercise presented here is based mainly on the institutions that have arisen from the landscaping study activities, i.e. a review of the literature and a series of expert interviews. A network analysis provides some insights into the kinds of organisations working in the space and highlights some areas where the MECS programme could usefully make contacts.

The stakeholder map presented in Figure 50 uses sub-themes of the modern eating topic as the 'hubs', which for the most part correspond to sections of the report. The colours represent the type of stakeholder. The map shows the main actors identified for each theme, and is intended to give insight into what stakeholders MECS could most usefully target to effect change in the modern eating workstream. It encompasses a selection of the stakeholders discovered rather than all to retain clarity. In particular, it intentionally does not list all academic literature sources and institutions that are drawn on in this report, as this is obtainable through the Bibliography.



Key:

- Non-profit organisations
- Intergovernmental organisations
- Private sector
- Research
- Donors

Figure 50 Landscape stakeholder network map

The mapping exercise so far suggests that there is little overlap between the sub-themes. The one notable exception to this is the FAO, which is active in food policy, nutrition, and food processing, and has conducted work in food waste and eating out. Interestingly, the FAO, along with special interest groups, has also addressed the role of culture in eating where stakeholders tend to focus on two core issues relating to transitioning food systems: 1) the empowerment of women; and 2) preserving traditions and local knowledge. There is, therefore, an opportunity for MECS to engage with the FAO. Market information companies Euromonitor and Statista are interesting because they not only gather information, but they also publish detailed research reports on some sub-themes. It is not clear whether they would be effective partners for the MECS programme as they are less engaged with technical research and influencing policy.

Donor organisations and research institutions are most commonly engaged in early work on innovative foods, which are pre-cooked foods developed to address nutrition problems. By contrast, the stakeholders associated with eating out are predominantly from the private sector. Displayed on the map is a small sample of such players on the international and regional industries of fast foods and online food delivery services, as well as investor Naspers (investing in cloud kitchens) and emerging market analyst Tellimer. The eating-out sector does not appear to have caught the attention of the non-profit sector, though it is expected there are NGOs and advocacy organisations working to improve street vendors security and environments, and the FAO is also involved in this. The academic literature on eating out studies came from a large range of University institutions which could not be condensed into a few key players, so these are not included, but there was a concentration of studies on South Africa by various South African universities.

In processed foods, we have identified a number of private sector companies making food processing equipment, a sample of which are displayed on the map. There is also interest from the UNDP, promoting local industry involvement in food processing. Local food processing companies have been identified in African countries, but this is not yet an exhaustive list and these have not been included in the map.

Food waste has a high political profile, reflected in the strong presence of non-profit organisations. The reduction of food waste through use of refrigeration is a common interest across four types of stakeholders. It brings together non-profit organisations involved in advocating, researching, and incentivizing development of efficient and low-cost refrigeration appliances (Global LEAP, E4A, CLASP); research institutes (Lawrence Berkeley Lab); intergovernmental organisations (IRENA); and the private sector (companies such as M-Kopa marketing fridges to SHS customers).

The nutrition transition is commonly discussed in academic literature and some key institutions are picked out on the map. In addition, two examples of transnational food corporations (TFCs) are mapped, as the increased presence of TFCs is influencing food prices, availability, and preferences through aggressive marketing.

The map alludes to the different ways in which international governance structures are mobilised in the designing of food policy. International organisations such as the WHO, FAO and The World Bank are particularly active in identifying the most significant food trends that require immediate responses in the form of policies, legislation, and funding. Regional inter-governmental organisations (COMESA, ECOWAS, ASEAN, BIMSTEC etc.) have been seen as an opportunity to reach international agreements on food policy, but the implementation and enforcement of these agendas remain a matter for individual countries. National and sub-national policy-making bodies have been intentionally omitted from the map, due to the wide range of ministries, agencies, and institutions involved in food policy in any given country.

12 Conclusions

Modernising food systems are experiencing a transition in cooking practices, away from labour- and time-intensive meal preparation in the home, and towards a greater availability of commercially-processed food requiring little-to-no cooking at the household level. This has significant implications for the MECS programme, which seeks to facilitate the transition towards clean energy in 15 countries across Africa and Asia through cooking-orientated services. By exploring the wide-ranging literatures associated with food processing, food culture, eating habits, food policy and food systems, and by consulting experts and local stakeholders in these areas, this report identifies key areas in which the MECS programme is well positioned to facilitate the clean energy transition in line with these developments.

The processing of raw foods is a human phenomenon, and encompasses a range of activities, techniques and technologies - both traditional and modern. 'Pre-cooking' enables food to be prepared and cooked at scale and, when made available to consumers, these products can provide a convenient way for people to access key

nutrients and diversify their diets, without needing to spend hours in the kitchen. These foods take various forms, from pre-cooked or fermented legumes and vegetables, to snacks and ready meals, to street food and fast food alternatives. ‘Ultra-processed’ foods are becoming increasingly common and tend to lack the nutritional value of more simply prepared foods, but it must be recognised that the concept of food processing is not necessarily an unhealthy one; processing and pre-cooking can preserve or even enhance the nutritional value of foods, and has the potential to reduce the risk of contamination and food-borne diseases through the monitoring of standardised and certified practices.

In MECS countries, small and medium sized enterprises dominate the commercial food sector: supplying products to informal markets, selling meals as street vendors or small restaurants, making use of e-commerce, and bringing locally-sourced, traditional foods to market in more convenient and simply-processed forms. However, it is difficult for many of these SMEs to scale up their businesses, due to the costs of mechanisation, problems accessing finance and being investment ready, barriers to regional trade, the costs associated with implementing and monitoring good manufacturing practices, competition from large food corporations, and the devastating impact of natural and man-made disasters on production, including droughts and the ongoing global pandemic. In contrast to some of the large organisations, these SMEs are far less likely to be using modern energy for cooking, and for a variety of reasons. These may include lack of access to electricity, familiarity and availability of wood, charcoal, or kerosene, as well as concerns over the cost, reliability or availability of electricity and LPG.

These trends present several opportunities for the MECS programme to engage with the commercial food sector, to facilitate the modern energy transition and to ‘change the narrative’ around clean cooking. Traditionally, clean cooking agendas have been driven by the environmental, health, and increasingly financial impact of using wood and charcoal as cooking fuels, which are known to contribute to deforestation, climate change, and indoor air pollution, and are becoming more expensive for many consumers. In the past, much of the attention has been on improving the combustion efficiency of cookstoves, but this has failed to keep up with changes in demographics and the increasing affordability and availability of cleaner, alternative energy sources. This report provides an important contribution to this debate, showing how food system transitions are largely driven by urbanisation, rising disposable incomes, improved business environments, and the demand for convenient and varied food products. If clean cooking agendas are to succeed, it is imperative that the solutions being proposed reflect changes in food systems, and can target and help scale-up commercial food enterprise. However, this is not without its challenges. Cooking in a commercial, industrial, or institutional setting requires a significant energy load not just during the cooking process, but also in preparing, storing, and even distributing the food items. The cost and reliability of energy is thus of paramount importance to the viability of these commercialised operations.

It is also important to recognise that any energy-orientated intervention into the commercial food sector could have positive or negative impacts on other aspects of the food system, including nutrition and diet diversification, food safety, food waste, and local economic development. Without adopting a targeted approach, facilitating transitions across the food system could speed up the shift towards ultra-processed foods becoming more commonplace, and at the expense of the health and wellbeing of consumers, and the prospects of smallholders, food entrepreneurs and SMEs. Speaking to food system experts and stakeholders, there appears to be significant opportunity for the MECS programme to collaborate with institutions involved in the economic and nutritional aspects of food system transitions, utilising its focus on clean, modern energy to help scale-up the commercial food sector and contribute to local value addition, diet diversity, and health eating. Nutrition needs to be at the heart of food thinking in the MECS programme.

This report is not an exhaustive account of the dynamics, challenges, and future prospects of modernising food systems. A detailed analysis of the topic is limited in part by the lack of up-to-date, locally-produced information concerning such changes. Food system transitions are complex and multi-sectoral, and include dynamics that are specific to individual countries. Nevertheless, the study highlights areas where there are gaps in relevant knowledge, and where there are opportunities for enhancing development thinking:

- **Food innovation.** There are nutrition and food security hazards associated with the nutrition transition towards maize, rice and wheat, and away from traditional crops that tend to be more nutritious and more resilient. Although quick cook foods such as pasta and white rice align with the MECS goals from an energy point of view, nutrition needs to be at the centre of programme activities. SMEs and research institutions are innovating in the processing of nutritious foods to meet demands of modern consumers.
- **Eating out** is a common practice and still a rapidly growing market, especially in urban areas. Yet little research has been done in this sector and still less on the energy implications of street foods, for example. There may be some interesting opportunities for transferring food preparation innovations into developing country contexts where appropriate, e.g. cloud kitchens. Delivery services are another rapidly growing sector, but one which is well served by commercial companies and transnational companies.
- **Food waste.** Consumer food waste in low income countries is relatively low and, in rural areas in particular, food waste may subsequently be used e.g. animal fodder. The majority of developed country solutions found in the literature are, therefore, largely inappropriate. Food sharing from institutions such as hotels and restaurants may be an exception to this. An issue almost entirely absent from the northern based literature is the role of refrigeration. Access to refrigeration is linked to access to electricity. Although much of the work on efficient, low cost refrigeration is associated with off-grid systems, there is a good degree of synergy with the MECS programme's approach to encouraging grid utility companies to stimulate demand by promoting cooking with electricity
- **Consumer education.** Learning how to cook is important in a number of ways. For example, the nutrition transition towards maize, rice and wheat means that some cooks have forgotten how to cook using traditional grains, food companies spend advertising money raising awareness of new products, and many food waste interventions are based on giving people information. MECS has already provided education by publishing cook books and engaging with food bloggers as a means of promoting the skills required to cook successfully with electric pressure cookers.
- **The modernising food systems debate.** Each of the sub-themes in the study are linked in some way to food systems, yet they represent only a fraction of the disciplines involved in the ongoing debate on modernising food systems. Experts advocated taking a systems approach to engaging in food systems, yet none had considered the energy required to cook foods in the household kitchen, which seems a remarkable oversight. This presents opportunities for engaging with a wider group of stakeholders.

At present, there appears to be a widespread desire – both in the food industry and amongst the public – for a significant localisation of the food chain to support local producers and value-added enterprises and improve local food security. It is plausible that a modern energy transition can form an integral part in the long-term sustainability of this process.

13 References

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